SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

April 1, 1996
NSRP 0506
N6-94-1

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

World Class U.S. Shipbuilding Standards

Task 2: The Management Plan

Part 1: Trip Report to Odense Steel Shipyard, Lindo, Denmark

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

in cooperation with
National Steel and Shipbuilding Company
San Diego, California

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CDI MARINE COMPANY
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April 17, 1996

A. W. van DIJK
Odense Steel Shipyard Ltd.
PO Box 176
DK-5100
Odense C. Denmark

Dear Mr. van DIJK:

Enclosed is our final Trip Report report, (incorporating your comments), of our visit with your shipyard. These report replaces your copy of the Draft Trip Report. The discussions and information provided on your World Class Shipbuilding Standards development and management program was constructive and informative.

You will observe that the Attachment (1) section, titled "Index of Odense Steel Shipyard Standards", has been deleted and Attachment (2) has been renumbered to (1), accordingly.

Again, on behalf of all team members, I wish to thank you and all of the people at OSS for your quality time and thorough coverage of the standards and CAD/CAM questions that we asked. Your hospitality was appreciated very much.

All of the team members look forward to seeing you, should opportunity present itself, at future functions involving the World Shipbuilding Community.

Sincerely,

Devens D. Arnett
Director of Engineering

TRIP REPORT

NSRP STANDARDS TEAM VISIT

TO

ODENSE STEEL SHIPYARD Ltd.

LINDO, DENMARK

SEPTEMBER 25-27, 1995

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15 Nov,1995
Revised 22 Mar,1996

TRIP REPORT

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Encl (1) Odense Steel Shipyard Ltd. - Trip Notes
(2) Aerial Photo of Odense Steel Shipyard Ltd.
(3) Handout Information on HICADEC/PROMOS and LAN
(4) NSRP SP6 Project 6-94-1, World Class Shipbuilding Standards, Questions and Responses from Odense Steel Shipbuilding Ltd, Lindo, Denmark - Dtd 11/10/95

Traveled to Odense, Denmark on 22-23 Sept, 1995, to meet other United States Shipbuilders' representatives for a 3 day visit with Odense Steel Shipyard Ltd (OSS) personnel to learn about their development and application of standards to the commercial shipbuilding process

Team Members:

Phil Lloyd,	NASSCO
Walt Devine,	NASSCO
Raphael Cronin,	NNS
Bobby Joe Griffin,	Avondale Shipyard
Laddie Matherne,	McDermott Shipbuilders
Devens Arnett,	CDI Marine

The Team has endeavored to present the highlights of what we learned at OSS. Enclosures (1) through (4) provide further details.

About the Odense Steel Shipyard Ltd (OSS) and the AP Moller Group

OSS, located on the island of Funen, was started in 1917 by AP Moller. The original shipyard was located on a canal in Odense and in 1960, was moved to a newly built, larger vessel capacity yard in Lindo. The shipyard has remained a private company since founded 78 years ago, with leadership being assumed by AP Moller's son, Maersk Mc-Kinney Moller, on the death of his father in 1965. In 1993, Maersk Mc-Kinney Moller withdrew from the day to day management but remained as Chairman of the Board of the Shipowning Companies. An aerial view of the OSS Lindo Yard is provided as enclosure (2).

The shipyard is a company within the AP Moller Group, a world wide organization, which owns many companies and employs 30,000 people, in 200 offices, in over 60 countries. The AP Moller Group's Headquarters is in Copenhagen. The shipyard employs 2800 people - 2400 blue collar, 200 foremen and planners, 150 engineers and designers, 50 administrative. The shipyard acquired the Loksa Shipyard Ltd in Estonia in 1994, as a subsidiary, which presently employs 500 people in the production of hatch covers.

The AP Moller Group's Maersk Shipping Lines owns 150 vessels totaling over 7 million total dead weight tonnage; part of this fleet is 40 tankers totaling over 4 million DWT. Other subsidiaries within the AP Moller group include: oil and gas exploration and production, aviation (Maersk Air), supermarkets, container production facilities, electronic data processing, container ships, drill rigs and so on.

Discussion

OSS's Senior management had significant involvement in our 3 day, fully packed agenda. The principal participants were:

Peter Tang-Jensen	**Executive VP Engineering**
Torben Anderson	**Executive VP Development**
AW vanDijk	**Standards Group Manager**
Frank Gad	**Executive VP Commerce and Finance**
Erik Kristoffersen	**Naval Architect Manager Structural Engineering**
Erik Hansen	**Manager Machinery Engineering**
Arne Henriksen	**Coordinator HICADEC Hull Group**
Ejgil Norgaard	**Naval Architect Systems Manager HICADEC**
Ib Kromann	**Project Manager - Production**
Jens Flarup	**General Manager Machinery Design**
Hans Jorgen Christensen	**Hardware development, Asst to the President**
Bjorn Trasbo	**Manager Steel/Outfitting**

Their Standards Group consists of 2 full time people, manager AW vanDijk and his assistant, serving as administrators of the program. He is directly funded by the Danish Shipbuilding Association, to administer the Association's standards - DVS[1]. The Engineering disciplines provide all the required personnel for the technical development, maintenance, Classification Societies' approvals and CAD data base maintenance of the technical configuration of standards. The Standards Group provides the finished product in the correct format for OSS, distributes the standards to the 40-50 standards holders within the shipyard and maintains the central records file of same.

The standards history in Denmark and OSS started 30 years ago with the realization that shipowners wanted to see a standard for ships they were to purchase. They started with a Swedish Standard and began working on a Danish Shipbuilders Standard - the DVS.

1 - Danske Vaerfters Standardiseringsudvalg (DVS)
Shipbuilders Association Standards - Denmark

This was done by the formation of the Danish Shipbuilders Association and the subsequent establishment of 6 technical committees to develop standards. The members were assigned disciplines as follows: outfitting (no engine room or deck house), outfitting (deck house), steel work, electrical, engine room piping, and revisions. The Danish Shipbuilders Association is sponsored by all of Denmark's shipyards - 10 total - each paying a fee proportional to their size. The four major members of the Association are: OSS, Burmeister & Wain, Danyard and Man B&W.

The teams' effort focused on a series of developed questions on standards, which had been provided to OSS prior to our arrival. OSS did an extremely good job of answering these questions. The results are tabulated in matrix form in enclosure (4). We were provided with samples of OSS standards and many other informative handouts.

A significant amount of time was devoted to OSS demonstrating their very sophisticated HICADEC integrated CAD System. Hans Jorgen Christensen - responsible for development and maintenance of computer systems for OSS - presented the overview. The system featured a LAN with 700 pieces of equipment connected - 300 screens, printers and plotters, 150 engineering CAD stations and 250 PC's. The technical support for this area is provided by 12 full time OSS technicians and a manager. They are further supported by 25 people at AP Moller Group subsidiary Maersk Data - the electronic data processing enterprise I mentioned earlier. This network already provides for a paperless pipe fabrication shop and OSS is working towards creating a paperless work place, including shipboard! Enclosure (3) provides a pictorial overview of the OSS HICADEC/PROMOS CAD/CAM systems - (translation not provided for all documents).

The HICADEC System is used to develop the model lines and plate profile data in full. It is then linked to PROMOS System to provide background structure for outfit drawing development. The HICADEC System is used to develop and issue all structural and outfit drawings - including all material selection and quantities.

The HICADEC System controls all cutting and robot welding machines with the requirements being input by design and electronically linked to production. [Steel cutting data uses about 10 GB memory; standards uses about 100 MB. Nesting and other functions are supplemented by a supervisor input at the time of actual work to maximize material. Waste bins observed had minimal size scrap pieces.

Of significant difference to our conventional approach to design was OSS's assignment of the HICADEC design personnel to the production division. Following design completion, they work in the trades as a worker or supervisor in the fabrication and/or installation of their design product. Any problems encountered, resulting from a design development or deficiency, would be corrected in HICADEC by those same people, as applicable to their

assigned discipline. They would then return to production as their normal work assignment. OSS recruits their HICADEC designers from procuction and trains them in the specific areas necessary for them to accomplish the design work. This single issue is paramount to having the product meet the needs of the customer and at the same time, ensure that it was developed from a manufacturing point of view.

Also of note, was OSS's selection of schedule 40 steel pipe for all systems. Steel pipes requiring protection from the corrosive effects of a product, salt water and etc, are coated with a high quality epoxy paint product. This coating system is expected to be good, in many applications, for the life of the vessel.

Production steel work starts 10 months after contract award and outfit shortly thereafter. OSS is working towards a new goal of 7 months.

Enclosure (4) provides a basic matrix listing questions and responses from the OSS personnel. Additional responses from our Japanese shipyard visits will be added to provide an easy to use comparison format and to assure continuity of questions.

Summary

Although standards played the major role in their prepared material, the OSS's sophisticated approach to shipbuilding was emphasized - from the highly developed integrated HICADEC System design phases to the modern and efficient application of machinery and robots to carry out electronically controlled instructions from HICADEC. Their utilization of skilled personnel - production to design and vise versa - plus their simplification of the material selection, are just representative of the forward thinking philosophy applied at the OSS. We need to pay close attention to these concepts if we are to become competetive in the commercial shipbuilding arena.

OSS intelligently applies standards to satisfy customer quality and design adequacy requirements and also to ensure increased work productivity and proficiencies, necessary for them to remain a World Class Shipyard. They are continually striving to maintain their shipyard as a World Class Shipyard through the application of state of the art design and manufacturing technologies. They believe that building quality into their products to make them last longer and perform better, without excess maintenance, is the best selling feature they can have. The management and workers of OSS are in the business for the long term and it shows.

15 Nov, 1995
Revised 22 Mar, 1996

ODENSE STEEL SHIPYARD Ltd. - TRIP NOTES

(* indicates information duplicated in formal Trip Report, file: odense2.doc)

Attachments (A) Market Information Handout
(B) Hull CAD/CAM Design Information Handout
(C) Piping and Outfit CAD/CAM Design Information
(D) DVS Standards Organization Handout

WEDNESDAY 25 OCTOBER, 1995

Peter Tang-Jensen, Executive Vice President of Engineering

- Welcome to Denmark and the Odense Steel Shipyard Ltd (OSS) at Lindo.
- Tom Anderson - responsible for development of shipyard and robotics (plus any other areas of development). Highest concentration of welding robots in the world. 1 operator for 3-7 robots. High quality. [Software system provides for feedback on how robots performed task - i.e., what quality prep did they encounter. Will not perform out of spec work!] robots are Japanese made - by Hitachi.
- Ship costs are 65% material.
* • Shipyard is not ISO 9000 certified and does not intend to become so; however, they do apply the principals of ISO 9000.
- Robots use "smart" software and have the ability to recognize the joint configuration and select the correct program to use for welding. Eliminates need for many manhours of engineering robot programming.
- Willing to sell DVS to USA.
- ISO 799 being revised at OSS - USCG provided comments.

Frank Gad, Executive Vice President of Commerce and Finance

- Refer to Attachment (A), Market Information Handout.
* • In present location since late 1950's [old shipyard limited to 40K DWT - new yard 650K DWT]. 1000 ton bridge crane, 150 m wide, 90 m high. Shipyard occupies a portion of 100 acres available. 2800 employees [2400 blue collar workers, 200 foreman/planners, 150 engineers/designers, 50 misc.].
- Sales history: 1989 - 1.85 BDKKroner, 1994 - 3.4 BDKKroner. Market share: Japan 42%, Europe 24%, Korea 16%.
- 14 Association of Western European Shipbuilders (AWES) market share: Germany 34%, Denmark 10%, Italy 15%, Netherlands 11%, Spain 8%, Norway 7%, Finland 5%, UK 4%, France 3%, Belgium 2% and Portugal .4%
- Most shipyards are subsidized - Denmark shipyards are not. Need Organization for Economic Cooperation and Development (OECD) agreement.
- Denmark has 7 large shipyards. OSS has 50% of Denmark's shipyard work and 2.8% of the world market.
- World output in MGT: 1975 - 21, 1985 - 15, 1988 - 9, 1994 - 13. [Korea has 32% of market this year .]

- New yards being built in Germany and Korea - public yards! Korea increasing capacity by 10-20%. OSS encourages OECD agreement.
- OSS is in world's top 3 suppliers of containerships. Other major builders are IHI, Samsung, Hyundai and Hanjin.
- Have produced six 300K DWT double hulled tankers having "clean tank" design for easy stripping/cleaning and reduction of lost cargo (non "pumpable"). Major structure restricted to wing and centerline tanks.
- Currently building first of twelve 85K DWT containerships (for Maersk Shipping).
- OSS has invested $150M in their yard (made from operations) since 1990's.
- AP Moller Group container factory producing one 40' container box in 15.5 minutes. Just starting reefer box fabrication at one in 2 hours - expect to reduce this time.
- Recently purchased Estonia Shipyard is producing hatch covers. Increased employment from 100 to 500 people. (New requirement for Estonia Yard was to commit to a production schedule.)
- AP Moller Group has many companies - most created in 1990's. All profitable.
- Cost structure of a crude carrier. Material 63%, wages 17%, energy/ maintenance/depreciation/data processing/etc. 20% (R&D 3%).
- OSS spends ~1% on sales vs. 10% in Japan.
- OSS works towards assembly factory and minimizes sub-contracting whereas, Japanese maximize sub-contractors.
- Material buy for containerships: 37% Denmark, 30% Other European Unions Countries, 27% Japan, 5% Norway and Eastern Europe (each).
- Mitsubishi and Hyundai looking at the cruise ship market. This market is presently predominated by the European shipyards. Market demand in this area expected to continue.
- Denmark produces ~ 200K bbls of crude per day. This meets Denmark's needs and permits 30% export.
- Cost in hours per CGT for Europe varies from 20-80 with wages across the board ~ equal.
- Automation programming done in design and input to CAD/CAM. Individual program for specific tasks called out by spec and down loaded to robotics/automated functions.
- Frequently use mockups with customer. Found to eliminate lots of debate as to what the requirements were.
- Selected automation is established to do relatively few - but repeatable - functions at each station for efficiency through familiarity vs. many varied functions at every station. Benefits are increased skill levels of workers and minimum set up time as equipment is already present.
- OSS Standards, 9 volumes, 580 standards. Supplemented as necessary by Others' standards. OSS standards are considered production ready details whereas National Shipbuilding Standards are more performance based.
- Visited Steel Fabrication area. Observed plate operations such as: automated painting, electronically controlled plasma cutting, movement, robot welding of

shapes and robot welding of units - all in process with only one or two workers visible at majority of stations.

THURSDAY 26 OCTOBER 1995

- **Requested a listing of OSS Standards and representative samples of common use items such as pipe hangers, cableways, ladders and etc.. Copies provided. (Refer to Attachment 2 to Question and Response Matrix - Enclosure (4) to trip report memo, file:odense2.doc, dtd 11/15/95).**
- **Given a demonstration of OSS CAD/CAM HICADEC/PROMOS Systems.**
  - ⇒ **All hull lines are entered into HICADEC (both sides of plates are defined; interpolation is not required).**
  - ⇒ **CAD standards are rules and geometry**
  - ⇒ **Changes to the model in HICADEC will regenerate model and produce new dimensions on drawings.**
  - ⇒ **All plate labeling and other markings are driven from HICADEC automatically - eliminating "people" markup errors. All names/numbering have intelligence and tie to a major product. (Refer to Attachment (B), Handout Information on HICADEC)**
  - ⇒ **Extraction from HICADEC Model for text or dimensioning, etc., provide basis for steel drawings (and background structure for outfit drawings).**
  - ⇒ **Drawings will not be required for all plates in the future. Data resides in HICADEC and will run the shop system processes directly.**
  - ⇒ **System for cutting/marking plates identifies changed pieces from original input.**
  - ⇒ **~ 20 profile sketches sent to production- those requiring cutting of holes after shaping. All remaining information transmitted electronically to Production Management System.**
  - ⇒ **HICADEC rules automatically define which path the product flow will use - rule application is checked for completeness.**
  - ⇒ **In planning stage, manhours for fitting and welding are calculated for each piece. This process permits adjustments to total plan, based on manpower and time for processes.**
  - ⇒ **Structure (lines, etc.) is first input into HICADEC and is subsequently the basis for input into PROMOS Model - the outfit part of the CAD/CAM system - to provide for the structure background integration into the outfit drawings. Refer to Attachment (C) for PROMOS Piping and Outfit CAD/CAM Information Handout. Changes to the HICADEC Model (structure) are sent once daily to the PROMOS Model and will show up in red in the model.**
  - ⇒ **Hitachi group is a partner to OSS in the development and use of HICADEC CAM and PROMOS CAM for use in the production robot lines.**

- 85K DWT containership has ~ 6500 pipe spools with all but 250 shop welded. The 250 that are field welded may only be tacked shipboard and completed in the shop in cases where the spool has to be removed for coating processes.
- * The CAD/CAM designer, once the design is complete and released for manufacturing, is routinely reassigned to production as a mechanic or supervisor in his area of design expertise. Problems that surface in production requiring design correction will cause the cognizant production mechanic or supervisor (the one who did the original design) to go back to Design and correct the problem and then resume his production assignment.
- Engineers, at the completion of a design engineering job, are often assigned to an engineering position in another AP Moller Group subsidiary to retain the skill for future new construction ship design work.
- * New construction ship CAD/CAM design utilizes mechanics and supervisors from production. They are given a refresher training program that focuses on what they need to know in HICADEC or PROMOS to accomplish the design. By utilizing this unique application of skilled people, OSS maximizes the "productivity content" of all design work.
- * Material selection is kept at the most basic level. For example, all pipe is schedule 40 carbon steel! If the piping will be used for sea water or corrosive products, it is given a high quality epoxy coating. All bolting is steel. All flanges are fabricated at OSS and are of the same design for all systems.
- CAD system uses the diagram to identify type and quantity required for all valves - accomplishes in one operation for all diagrams together. Provides purchasing with early identification of material requirements.
- CAD pipe drawings contain minimal information - only that required for the fabricator (on the screen only in the shop) or installer.

FRIDAY 27 OCTOBER, 1995

Ejgil Norgaard - HICADEC System Manager

- Standards for hull structure are set into database - [standard is a tool used to create correct shape in HICADEC, i.e., to create a hole, HICADEC looks for the standard for the type of hole specified and incorporates geometric requirements into dimensioned shape]. Resulting design has boundary, profile, shape, etc..
- HICADEC automatically recalculates shapes whenever changes are made to the model.

Arne Henriksen - HICADEC Coordinator

- Responsible to provide cutting data to production via HICADEC . Total HICADEC memory required for steelwork is ~ 10 GB. By comparison, all standards occupy ~ 100 MG.

Hans Jorgen Christensen - Hardware Development Manager, Asst to the President

- Responsible to the President for the development and maintenance of all CAD/CAM systems. OSS has 12 people committed to this effort and is further supported by 25 people working for Maersk Data - another AP Moller Group

subsidiary. It is very evident that OSS has and continues to pursue maximum benefits from the use of CAD/CAM state of the art.

- **LAN - 700 pieces of attached equipment. 150 CAD/CAM work stations, 250 PC's, 300 screens and printers. (Refer to Enclosure (3) to Trip Report Memo, file:odense2.doc, dtd 11/15/95)**
- **Working towards a paperless workplace. Have achieved this goal in the pipe fabrication area. Intend to implement even shipboard!**
- **Engine room is extracted from the model to add required details. Accomplished by dividing into 4 sections to permit proper resolution on the screen. Finished product is saved back into the model daily.**
- * **Production Steelwork generally starts 10 months following contract award with Outfitting shortly thereafter. New goal is 7 months.**

AW van Dijk - OSS Standards Manager

- **AW van Dijk actually works for the DVS, and is responsible for DVS Standards. (He is funded by DVS via OSS.)**
- **Standards do not exist in finished form in the CAD or any other electronic data base. At present, they have all sketches and some test in the CAD data base.**
- **All new and revised standards are sent to Mr. Moller for approval. (If no response by 6 weeks, they are issued.)**
- **need for standards must come from the people who use them.**
- * **Need for DVS? 30 years ago, OSS believed they were the "best" qualified builders in the world. They recognized foreign owners need to see a Standard. They started with a Swedish standard and began to produce their own standard.**
- * **DVS standards organization consists of 6 separate committees: (Refer to Attachment (D), Handout on DVS Standards Organization)**
  - **⇒ Outfitting (not engine room or deckhouse)**
  - **⇒ Outfitting (deckhouse)**
  - **⇒ Steelwork**
  - **⇒ Electrical**
  - **⇒ Engine Room Piping**
  - **⇒ Revisions**
- **Goal is no standard greater than 5 years old without a revision - even if just a review for currency.**
- **1.6-1.7 M DKK budget - all from shipyards - permits autonomy from government. All 10 Danish shipyards pay in proportion to their product volume and size.**

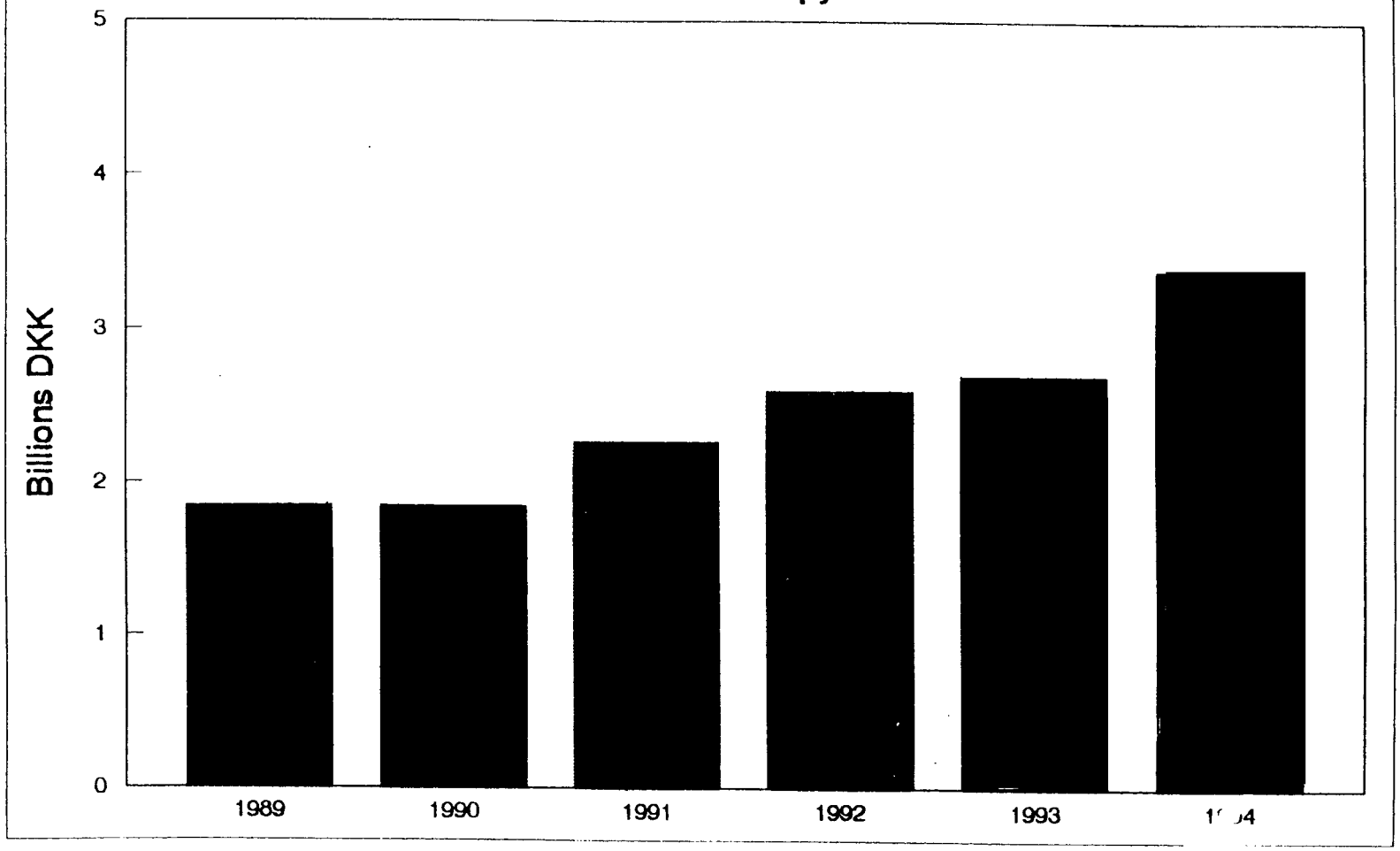
Attachment (A)

Odense Steel Shipyard Ltd.

Market Information Handout

Sales Development

Odense Steel Shipyard Ltd.



AWES shipbuilding
Output in cgt - 1994

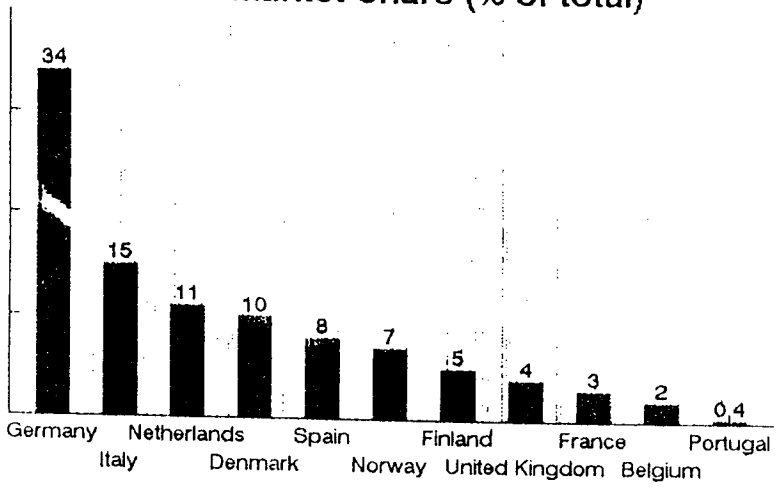
14 AWES members

Other Western European nations

Eastern European nations

Source: AWES

Awes Market Share (% of total)

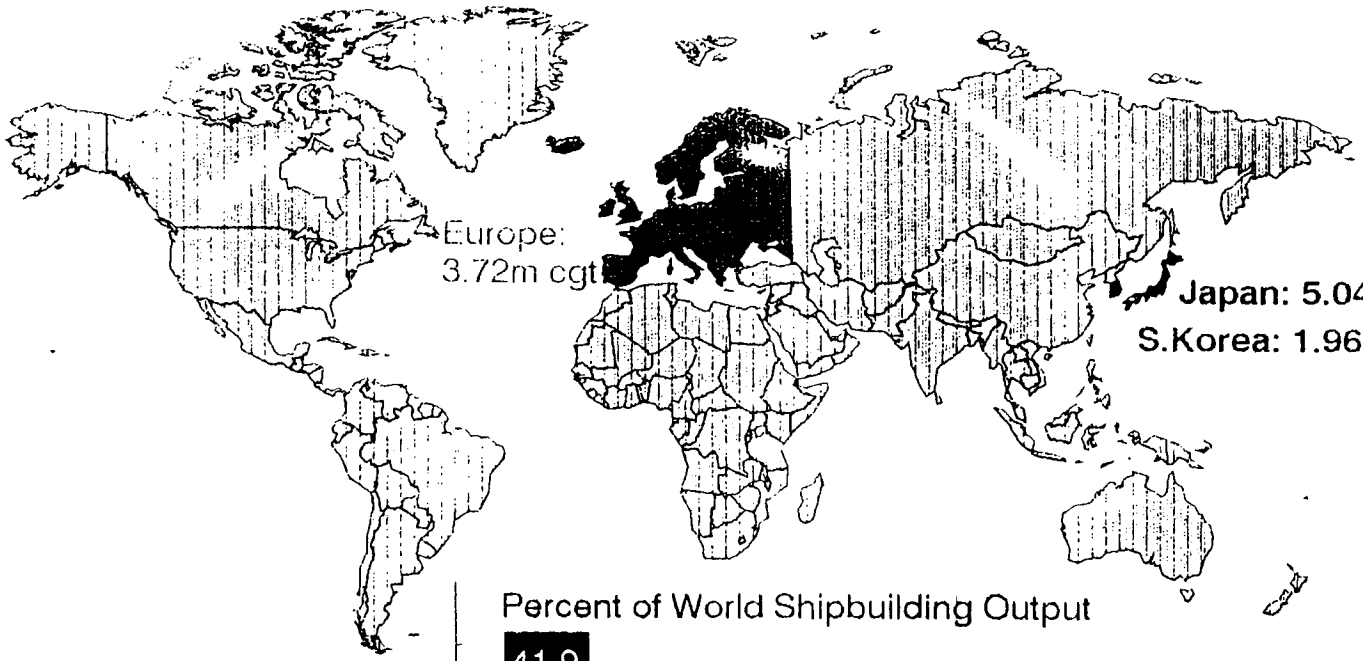


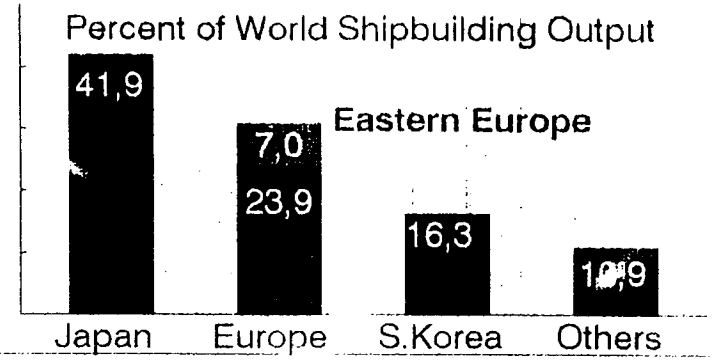
Germany	976,630 cgt
Italy	419,083 cgt
Denmark	303,595 cgt
Spain	230,934 cgt
Netherlands	315,869 cgt
Norway	197,099 cgt
Finland	144,961 cgt
UK	115,695 cgt
France	88,213 cgt
Portugal	16,482 cgt
Belgium	66,019 cgt

Proj\95\shipcap\AWES3

Major shipbuilding areas

1994: Output in cgt - and market share

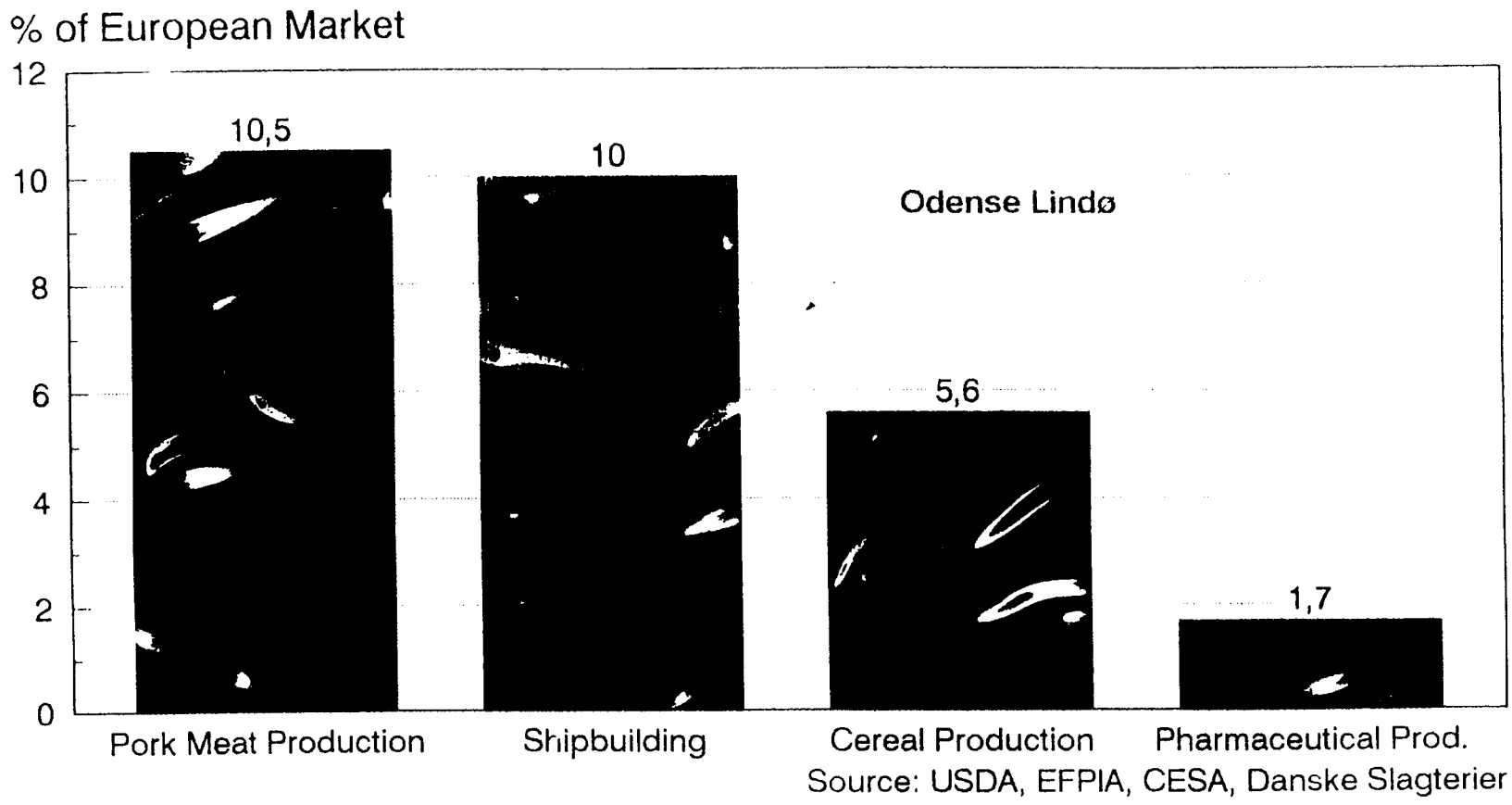




Source: CESA 1995

proj\95\capship\world2

Danish Market Share of W.European Production in Various Sectors



Source: USDA, EFPIA, CESA, Danske Slagterier

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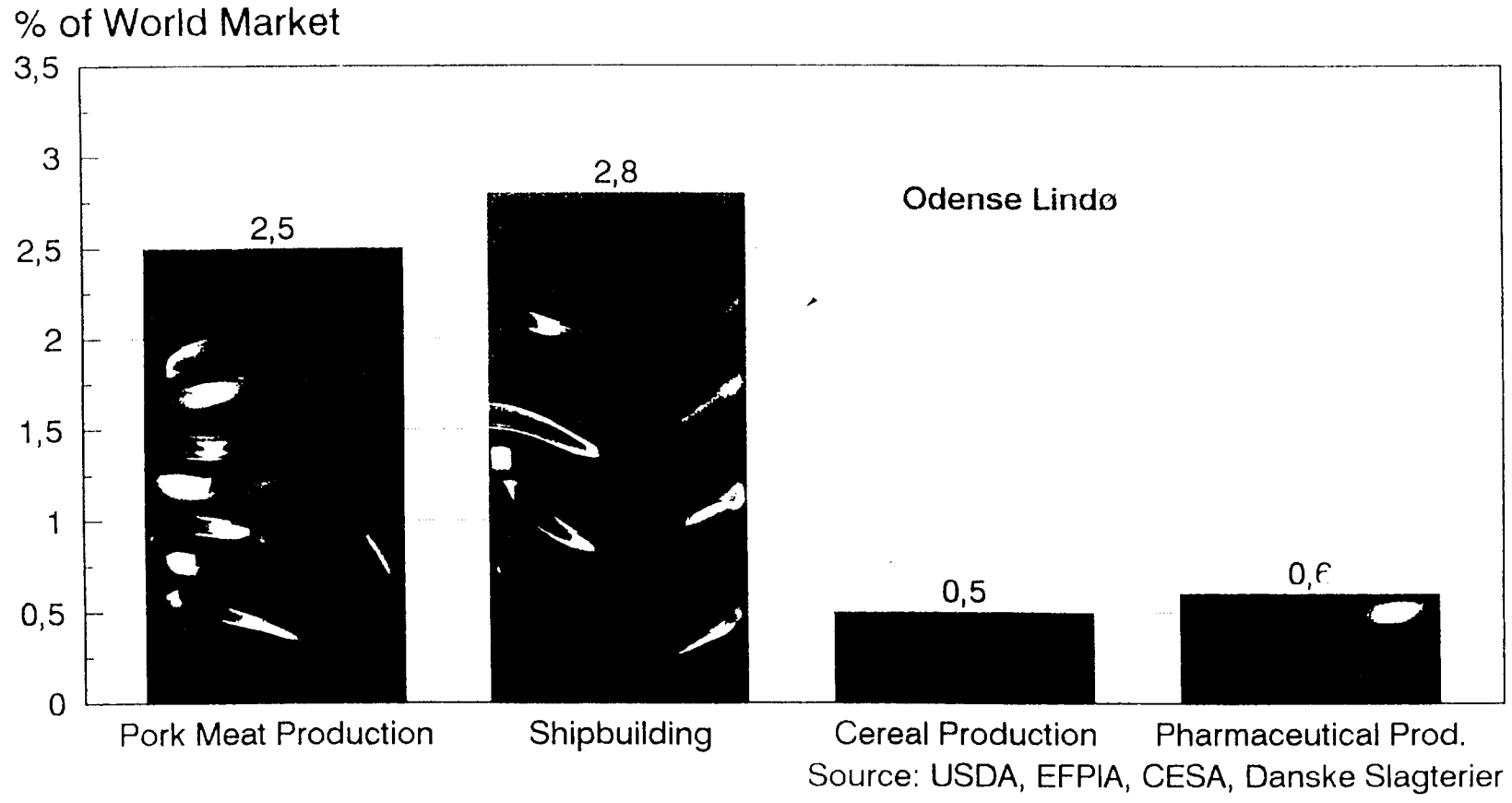
Danish Market Share of World Production in Various Sectors



Source: USDA, EFPIA, CESA, Danske Slagterier

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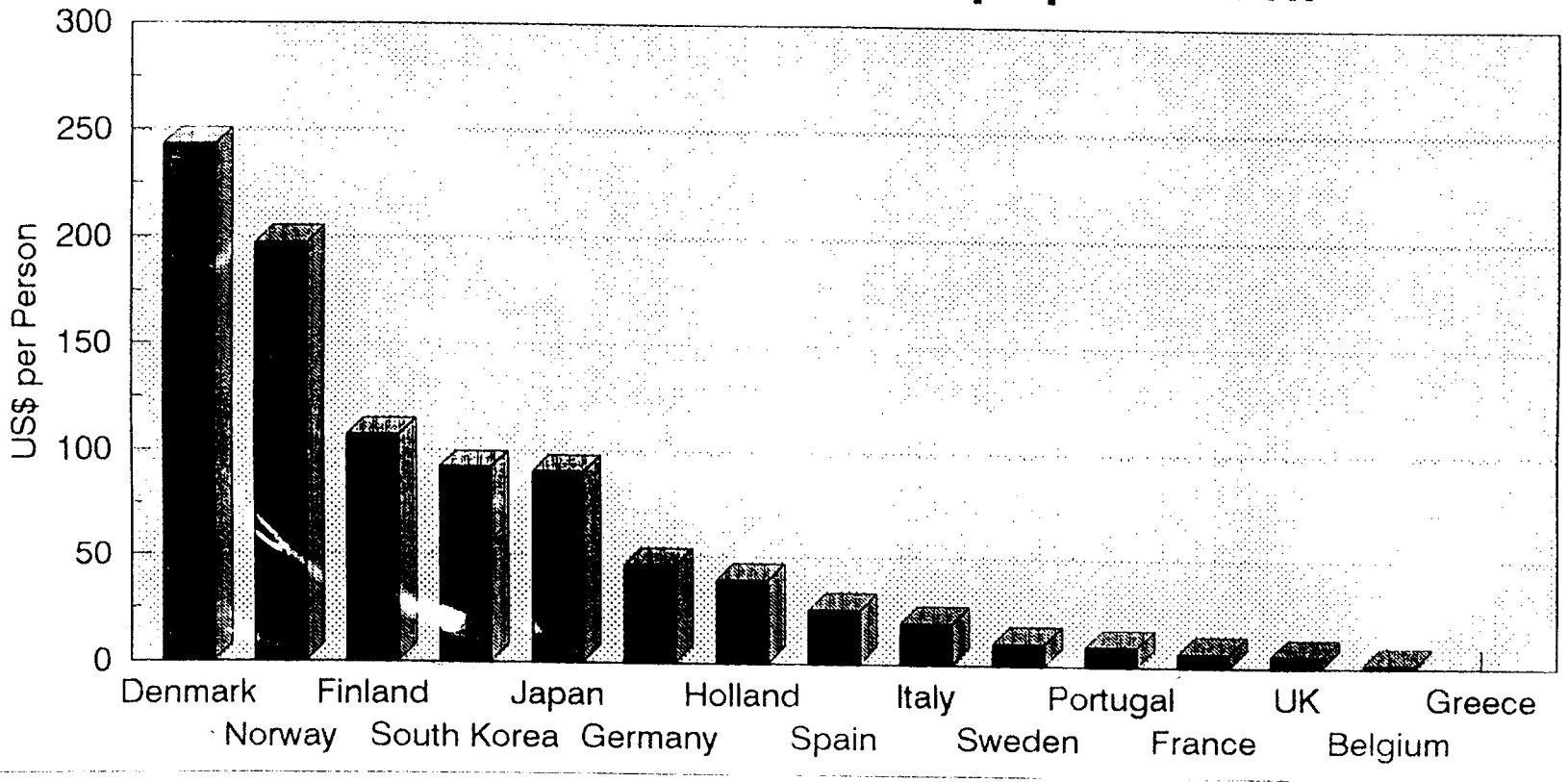
The Shipbuilding Industry's Importance Relative to Population

Production Value for New Ships per Person



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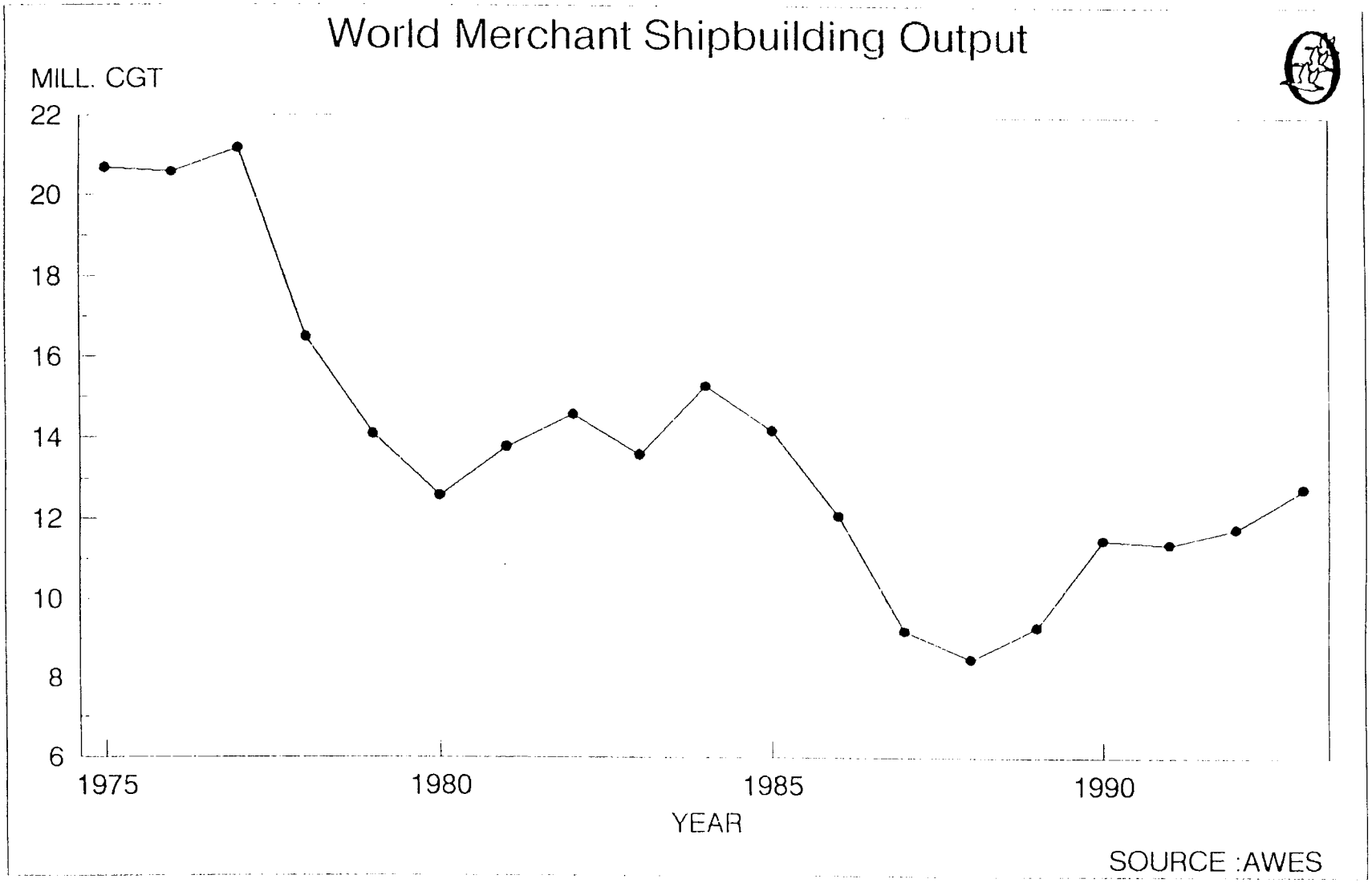

World Merchant Shipbuilding Output
MILL. CGT
22
20
18
16
14
12
10
8
6
1975
1980
1985
1990
YEAR
SOURCE :AWES

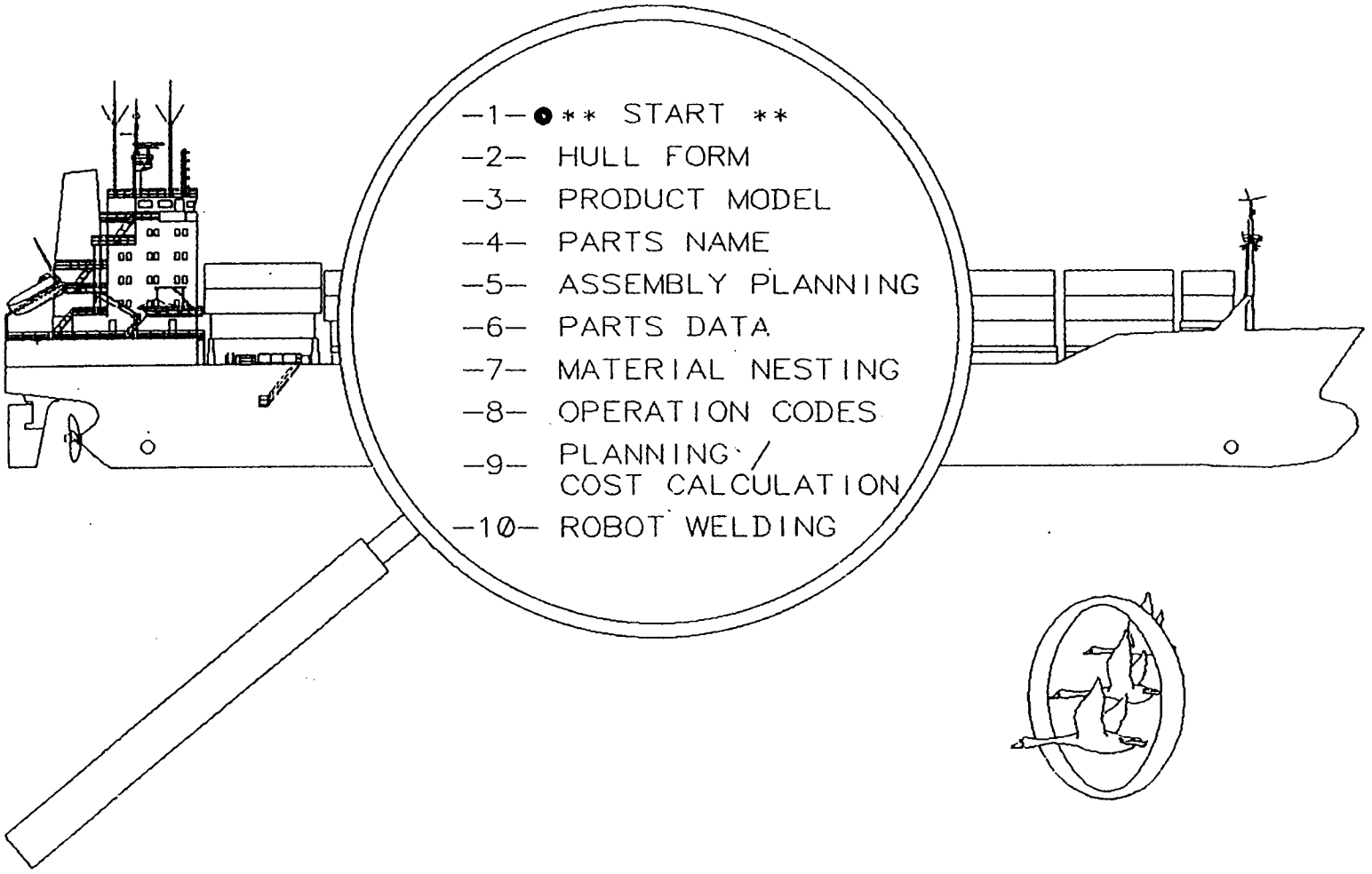
Attachment (B)

Odense Steel Shipyard Ltd.

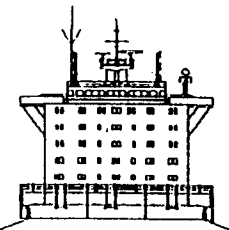
Hull Design Information Handout

Attachment (B) to
file: ossnotes.doc

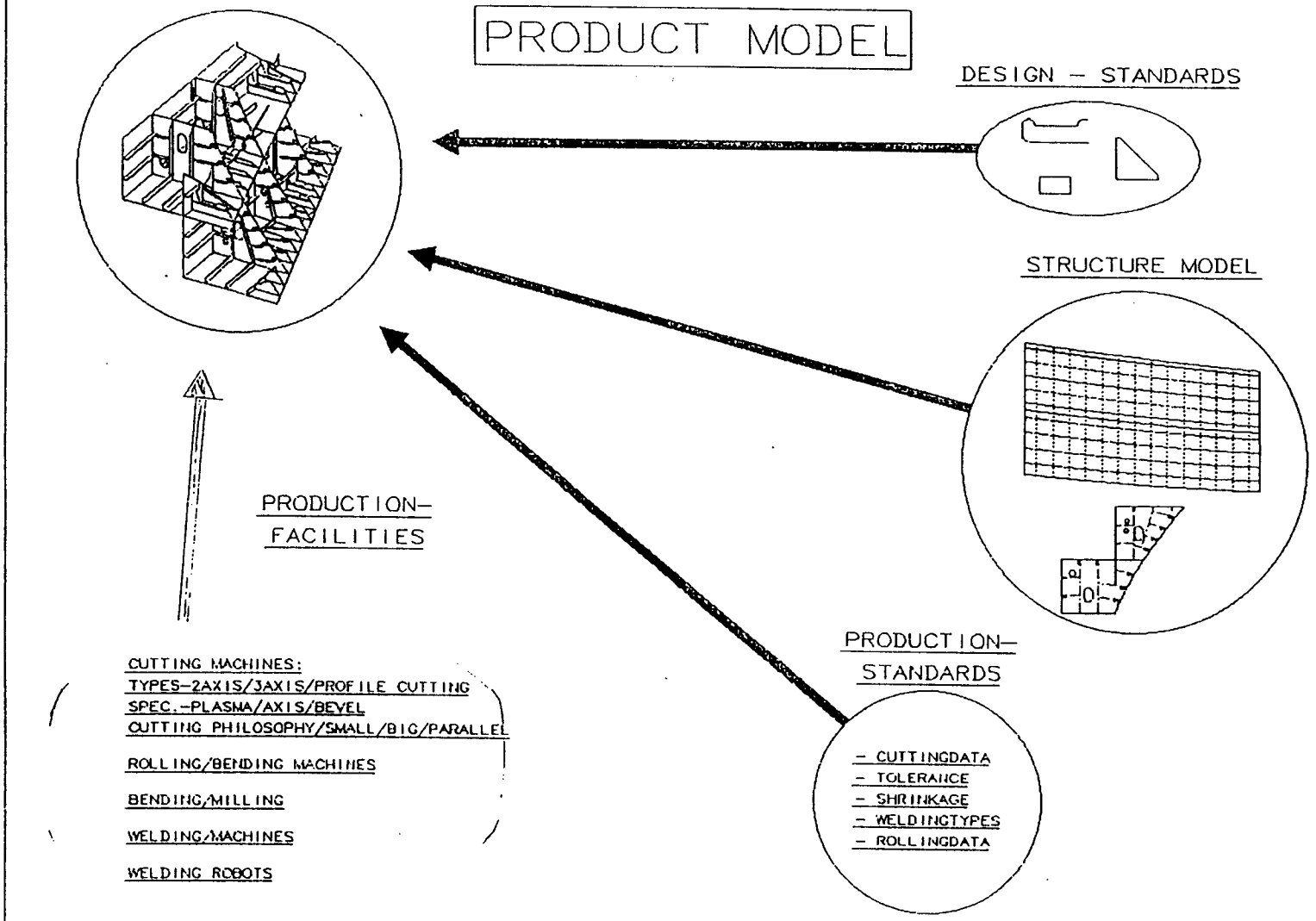
HULL DESIGN


-1- ** START **
-2- HULL FORM
-3- PRODUCT MODEL
-4- PARTS NAME
-5- ASSEMBLY PLANNING
-6- PARTS DATA
-7- MATERIAL NESTING
-8- OPERATION CODES
-9- PLANNING / COST CALCULATION
-10- ROBOT WELDING

HULL FORM

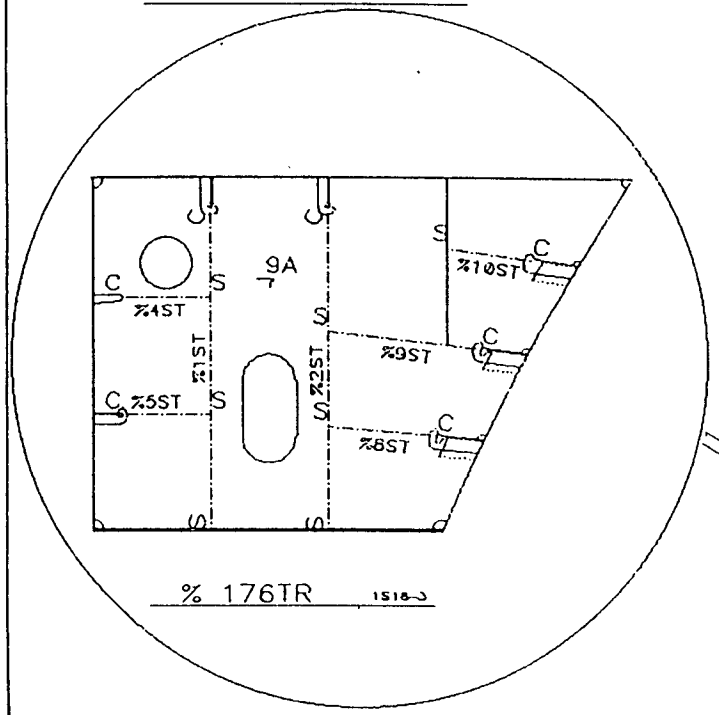


LINESPLAN / MODEL TESTING
DESIGN CALCULATIONS
DESIGN HYDROSTATIC DATA
DESIGN LOADING CONDITIONS
DESIGN DAMAGE STABILITY
DESIGN CAPACITIES
STRUCTURE DEFINITIONS


PRODUCT MODEL
DESIGN – STANDARDS
STRUCTURE MODEL
PRODUCTION–
FACILITIES
PRODUCTION–
STANDARDS
CUTTING MACHINES:
TYPES–2AXIS/3AXIS/PROFILE CUTTING
SPEC.–PLASMA/AXIS/BEVEL
CUTTING PHILOSOPHY/SMALL/BIG/PARALLEL
ROLLING/BENDING MACHINES
BENDING/MILLING
WELDING/MACHINES
WELDING ROBOTS
– CUTTINGDATA
– TOLERANCE
– SHRINKAGE
– WELDINGTYPES
– ROLLINGDATA
– 3 DIM. MODE
– MACH. CHARA

PARTS NAME

MODEL DRAWING



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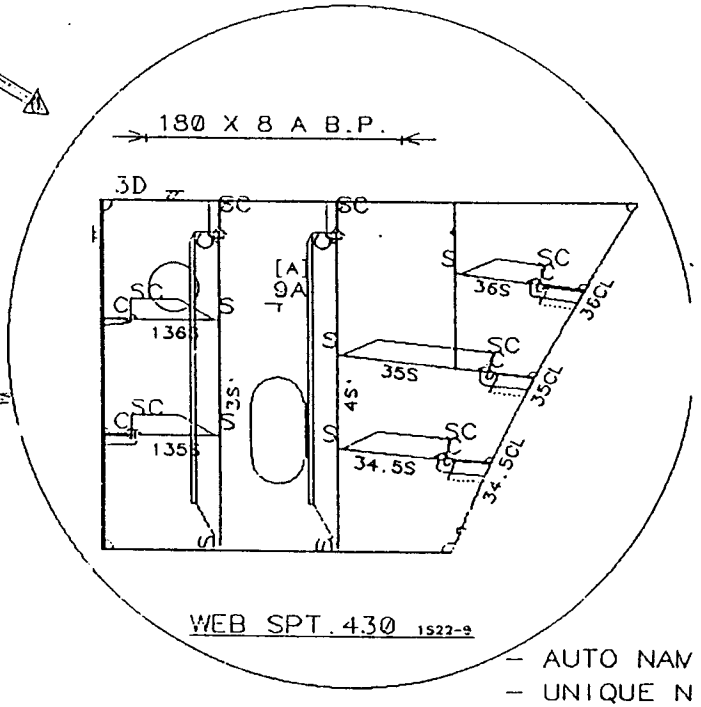
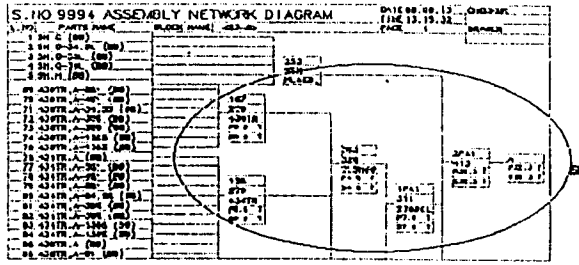
NAME DRAWING



L.NO	PARTS NAME
69	430TR.A-3S' (BB)
70	430TR.A-4S' (BB)
71	430TR.A-34.5S (BB)
72	430TR.A-35S (BB)
73	430TR.A-36S (BB)
74	430TR.A-135S (BB)
75	430TR.A-136S (BB)
76	430TR.A (BB)
77	430TR.A-3S' (BB)
78	430TR.A-4S' (BB)
79	430TR.A-5S' (BB)
80	430TR.A-34.5S (BB)
81	430TR.A-35S (BB)
82	430TR.A-36S (BB)

- AUTO NAM
- UNIQUE N

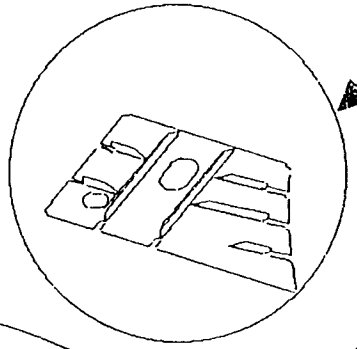
ASSEMBLY PLANNING

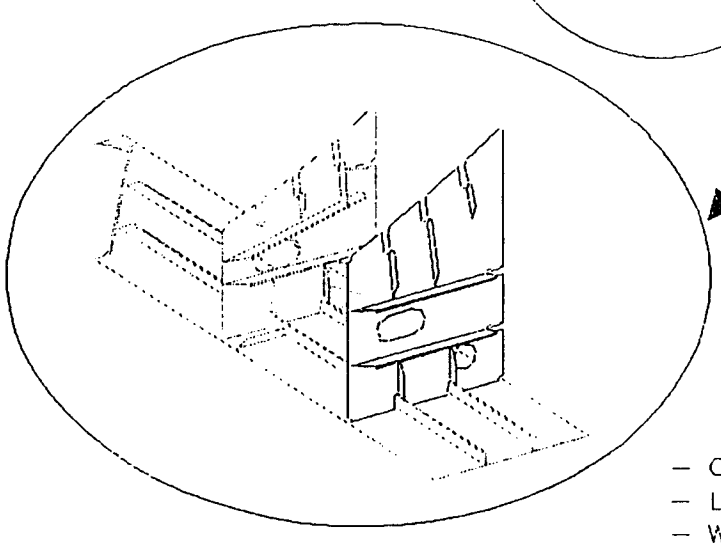


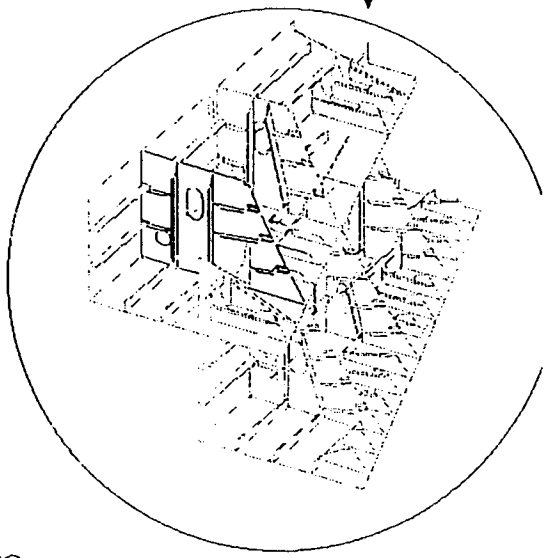
1S7
229
430TR
P0.6 T
S0.6 T

2PA1
413
P32.3 T
S32.3 T

3S3
328
2LBH+W
P4.0 T
S4.0 T



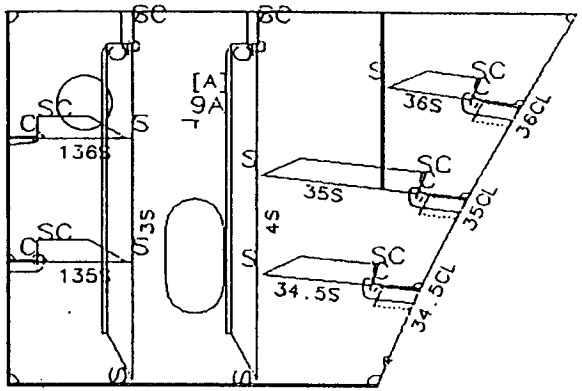


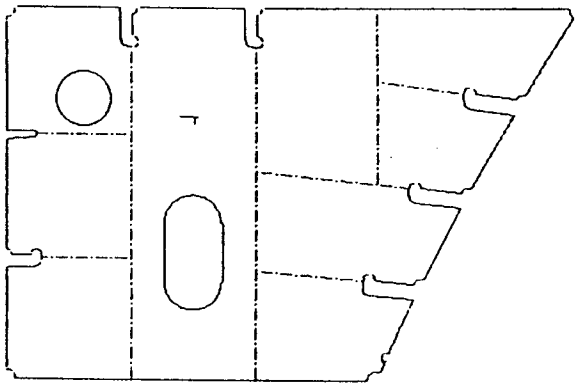


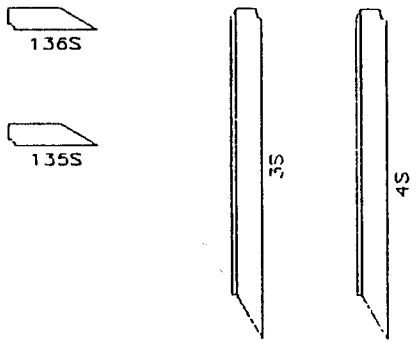
- OPTIMISATION
- LINE PROCESS
- WELDING PROCESS

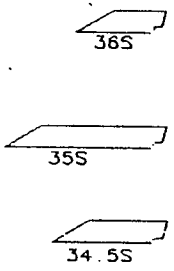
PARTS DATA

PRODUCT MODEL





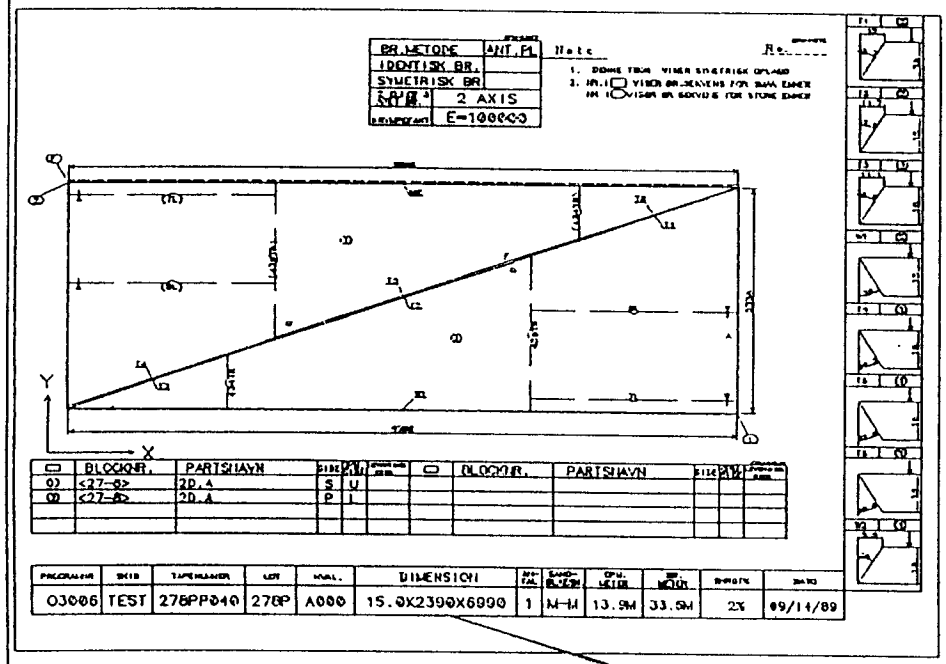




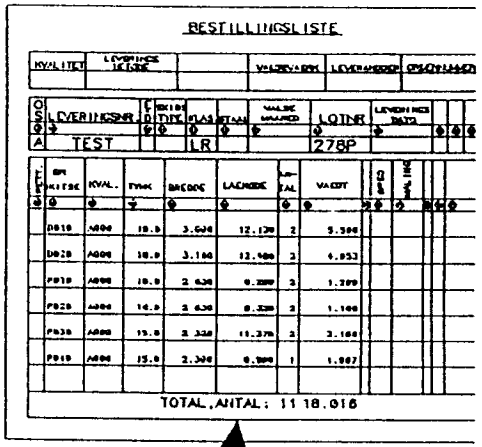
— PRODUCT
STANDAR

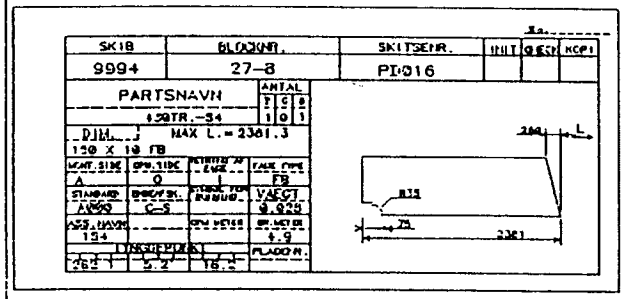
MATERIAL NESTING

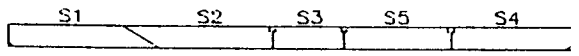
N.C.PLATE CUTTING



M.T.O.





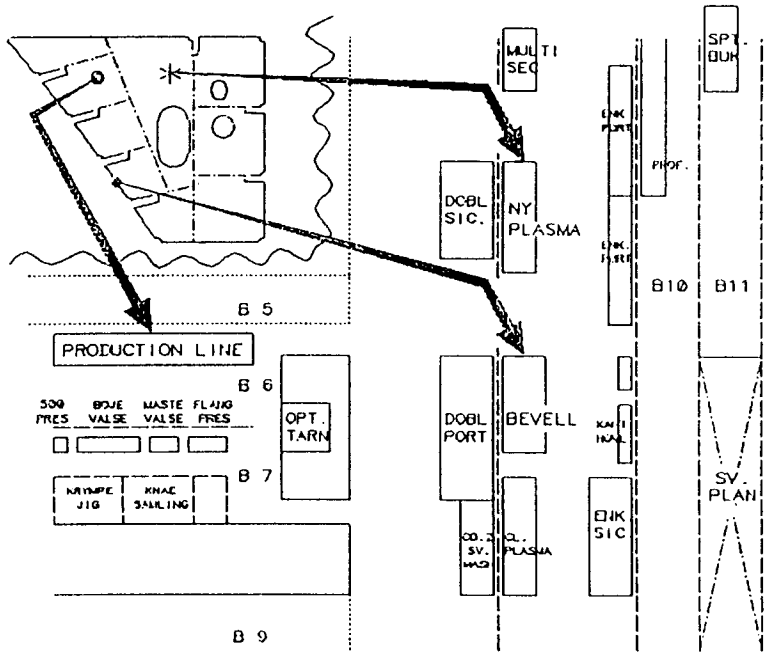


PROFILE CUTTING MACHINE

- MTO
- BEVEL CI

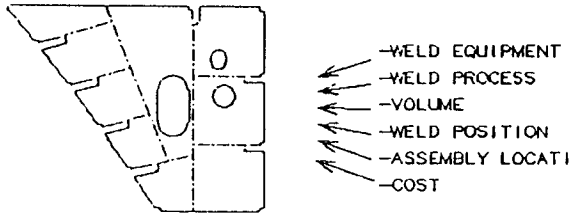
WORK OPERATION

OPERATION CODE



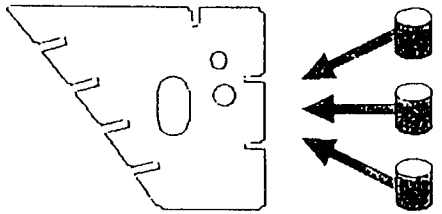
PRODUCTION FACILITIES

WELDING CODE



PAINTING CODE

PAINT TYPE / SPECIFICATION



– COST CALCULATI

PLANNING

S.NO 9994 ASSEMBLY NETWORK DIAGRAM

DATE 89.09.13 | CHECKER
TIME 13.15.32
PAGE 1 | DRAWER

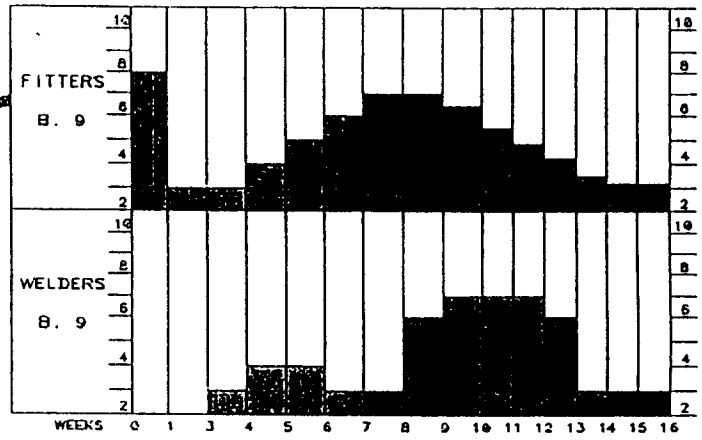
L.NO	PARTS NAME	BLOCK NAME <27-8>
10	2D.A (BB)	
11	2D.A-7L (BB)	
12	2D.A-8L (BB)	
13	2D.B (BB)	
14	2D.B-6L (BB)	
15	2D.C (BB)	
16	2D.C-3L (BB)	

251
210
2.NK.
PS.1 T
SS.1 T

MANHOURS	
FIT.	WELD.
32	20
20	24
30	53
24	17
36	54
82	36
370	240

C-PLANNING

					MANED	NOV				DEC			MANHOURS	
					UGE	944	945	946	947	948	949	950	951	FIT	WELD
NR	BG	SEKT	P	TEKST											
001	126	2278.	2	L.SKOD (311)		151								32	20
002	126	2278.	5	WEB+TV.SK.(413)		157	158	159						20	24
003	126	2278.	2	DELS.L.SK.S/B			351							30	53
004	126	2278.	2	DELS.L.SK.S/B			352							24	17
005	126	2278.	4	2 3.DAEK 427-443			251							36	54
006	126	2278.		2 3.DAEK DELSEKT					252					82	36
009	126	2278.		2 O/P L-SK/KLD									PA1	370	240



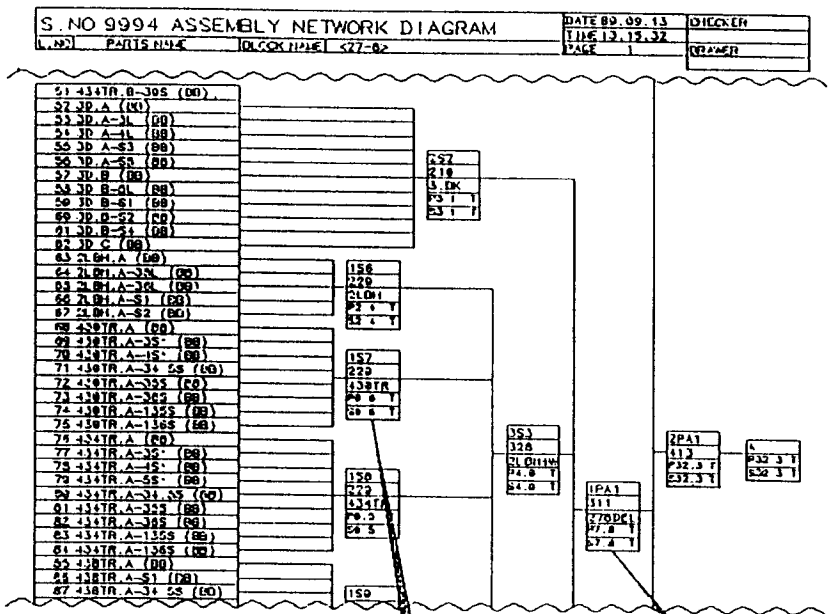
B-PLANNING

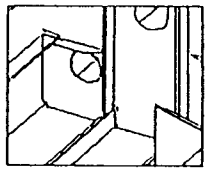
BYGN 126 UDCAVE A. SIDE 01 | REF. TIL PLAN 89-09-06

LB IR	SEKT.OR NR	BENAEVNELSE	TEGN UDS STAL	INDK. STAL	REV	MAR UGE	MAR DAG	OKT 941	OKT 942	OKT 943	NOV 944	NOV 945	NOV 946	NOV 947	NOV 948
89	1281	FORSKIB U/P	937		941				31		32			5311	
99	2278	O/P.L.SK/KLD.S/B	937		941				31		32			5311	
91	1191	BULB	934		938			52			5345	5342			

— DIRECT CA
MANNHOURS

ROBOT WELDING

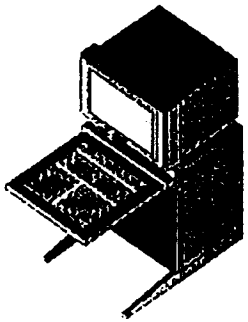




GRAFICAL SIMULATION

SIMPLE STRUCTURE

COMPLEX STRUCTURE



MACRO PROGRAMING

Attachment (C)

Odense Steel Shipyard Ltd.

Piping and Outfit CAD/CAM Design

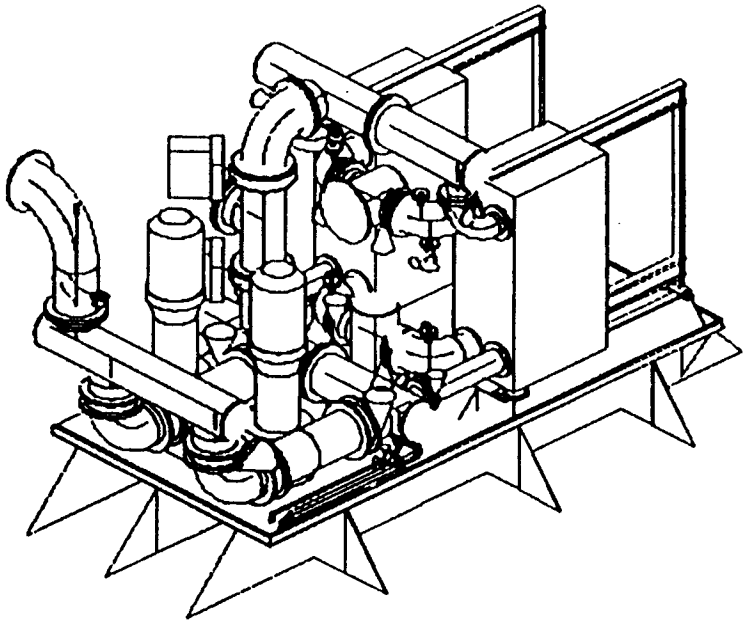
Information Handout

Attachment (C) to
file: ossnotes.doc

CAD / CAM

PIPING AND OUTFITTING

SYSTEMS

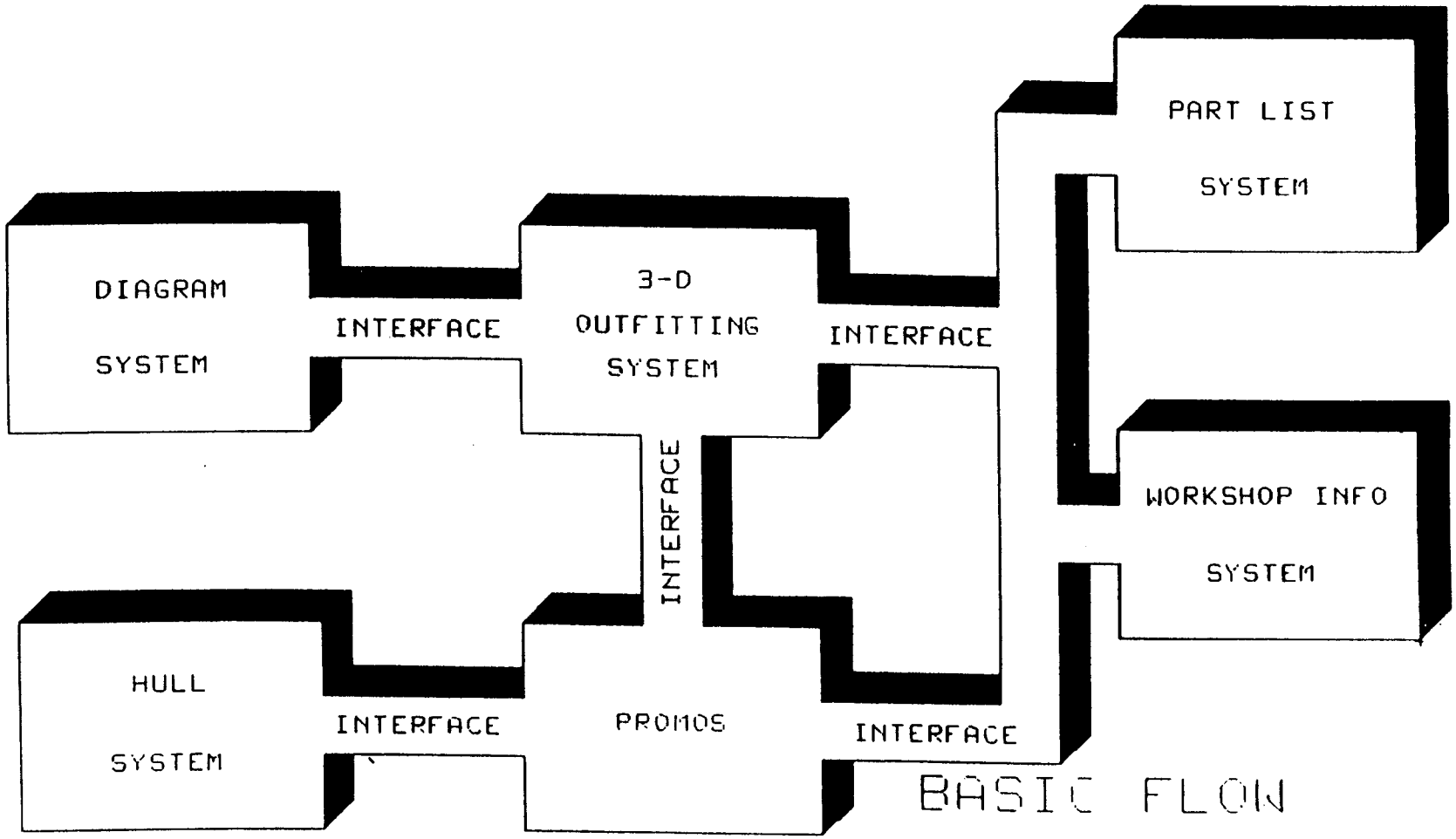


Odense Lindø

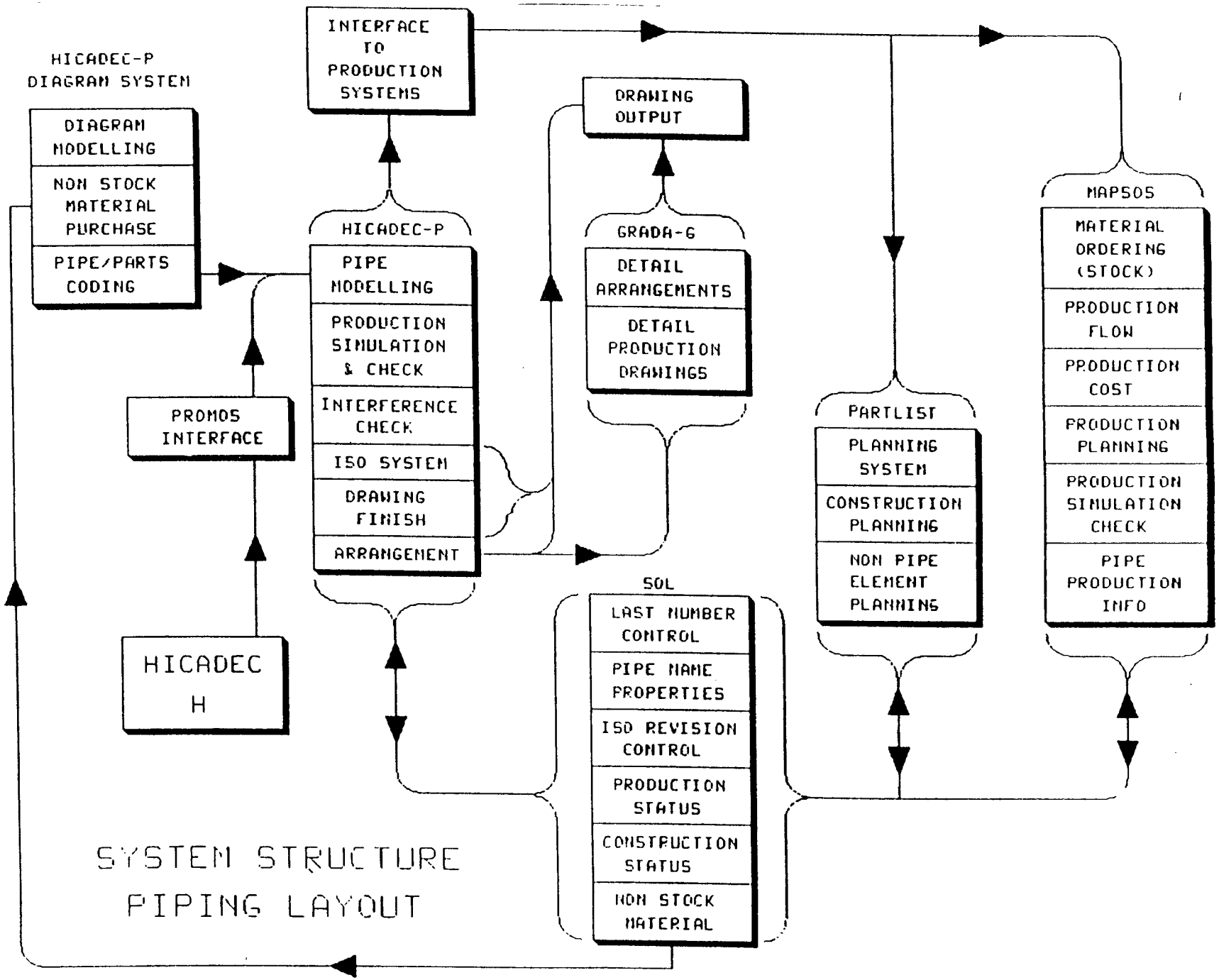
Odense Lindø

Odense Steel ShipYard Ltd.

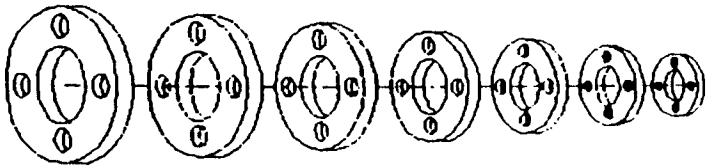
COMPUTER ENGINEERING

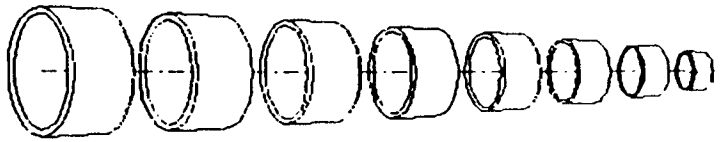


BASIC FLOW


HICADEC-P
DIAGRAM SYSTEM
DIAGRAM MODELLING
NON STOCK MATERIAL PURCHASE
PIPE/PARTS CODING
INTERFACE TO PRODUCTION SYSTEMS
HICADEC-P
PIPE MODELLING
PRODUCTION SIMULATION & CHECK
INTERFERENCE CHECK
ISO SYSTEM
DRAWING FINISH
ARRANGEMENT
PROMOS INTERFACE
HICADEC H
DRAWING OUTPUT
GRADA-G
DETAIL ARRANGEMENTS
DETAIL PRODUCTION DRAWINGS
SOL
LAST NUMBER CONTROL
PIPE NAME PROPERTIES
ISO REVISION CONTROL
PRODUCTION STATUS
CONSTRUCTION STATUS
NON STOCK MATERIAL
PARTLIST
PLANNING SYSTEM
CONSTRUCTION PLANNING
NON PIPE ELEMENT PLANNING
MAPSOS
MATERIAL ORDERING (STOCK)
PRODUCTION FLOW
PRODUCTION COST
PRODUCTION PLANNING
PRODUCTION SIMULATION CHECK
PIPE PRODUCTION INFO
SYSTEM STRUCTURE
PIPING LAYOUT

PIPES DEFINITION (CATALOGUE)





PIPING SYSTEM CODES

TREATMENT CODES

- NO TREATMENT - 00
- HOT GALVANIZED - 10
- HOT GALVANIZED + PRIMER - 11
- HOT GALVANIZED + FINAL COAT - 12
- HOT GALVANIZED + CTE - 15
- HOT GALV.+ POLYURETHANE + CTE - 16
- ZINCSILICATE - 21
- ZINCSILICATE +PRIMER - 22
- ZINCSILICATE + EPOXY - 23
- ZINCSILICATE + EPOXY (HB) - 25
- COAL TAR EPOXY - 41
- EPOXY PRIMER - 45
- SOLVENTFREE EPOXY - 47
- EPOXY PAINT - 48
- EPOXY POWDER - 51
- EPOXY POLYESTER POWDER - 54
- ALKYD PRIMER - 55
- POWDER + ENGINE ENAMEL - 58
- ACID PICKLED - 80
- ACID PICKLED / OILED - 81
- NYLON (SILGAN) - 90
- POLYETHYLENE - 91
- GEOMETEL - 92
- POWDER FLAME SPRAYING - 93
- HEAT RESIST SILICONE PAINT - 94

D DIMENSION CODES

A - 15	A - 400
B - 25	B - 500
C - 40	P - 600
D - 50	R - 700
E - 65	S - 750
F - 80	S - 10
G - 100	X - 20
H - 125	Y - 32
I - 150	Z - 450
J - 200	W - 550
K - 250	V - 650
L - 300	W - 800
M - 350	T - 900

MATERIAL	TREAT MENT INSIDE	TREAT MENT OUTSIDE	CLASS CERT.	PRESS NORM	PIPE CODE	PIPE NO.
					◊PD01	01
	51	51	NONE	MT10	◊PD02	02
	00	00	YES	MT16	◊PD03	03
	01	00	YES	MT40	◊PD04	04
	00	00	NONE	MT10	◊PD05	05
	00	00	YES	MT10	◊PD06	06
	00	00	YES	MT16	◊PD07	07
	51	66	NONE	MT10	◊PD08	08
	01	00	NONE	MT10	◊PD09	09
	00	00	YES	MT10	◊PD10	10
	01	00	NONE	MT16	◊PD11	11
					◊PD12	12
	10	11	NONE	MT10	◊PD13	13
	10	11	NONE	MT16	◊PD14	14
	10	10	NONE	MT10	◊PD15	15
STEEL PIPES	10	10	NONE	MT16	◊PD16	16
DIN 2458/1626 ST37.2	51	51	NONE	MT10	◊PD17	17
DIN 2448/1629 ST35	00	52	YES	MT16	◊PD18	18
	51	51	NONE	MT16	◊PD19	19
	00	52	NONE	MT10	◊PD20	20
					◊PD21	21
(SLIP-ON FLANGES 0530021)	00	51	YES	MT10	◊PD22	22
	00	21	YES	MT16	◊PD23	23
	51	66	NONE	MT16	◊PD24	24
	51	51	NONE	MT16	◊PD25	25
	00	51	NONE	MT10	◊PD26	26
	00	55	NONE	MT10	◊PD27	27
	00	45	NONE	MT10	◊PD28	28
	00	51	NONE	MT16	◊PD29	29
	00	55	NONE	MT16	◊PD30	30
	01	00	YES	MT16	◊PD31	31
	00	45	YES	MT16	◊PD32	32
	00	00	NONE	MT16	◊PD33	33
					◊PD34	34
	51	40	NONE	MT10	◊PD35	35
	51	45	NONE	MT10	◊PD36	36
	51	45	NONE	MT16	◊PD37	37
	51	41	NONE	MT16	◊PD38	38
					◊PD39	39
	00	00	YES	MT10	◊PD40	40
					◊PD41	41
	10	15	NONE	MT10	◊PD42	42
	10	12	NONE	MT10	◊PD43	43
					◊PD44	44
					◊PD45	45
	51	45	NONE	MT10	◊PD46	46
	51	66	NONE	MT10	◊PD47	47
					◊PD48	48
					◊PD49	49
	00	00	NONE	MT10	◊PD50	50
					◊PD51	51
					◊PD52	52
					◊PD53	53
					◊PD54	54
					◊PD55	55
					◊PD56	56
					◊PD57	57
	10	10	YES	MT160	◊PD58	58

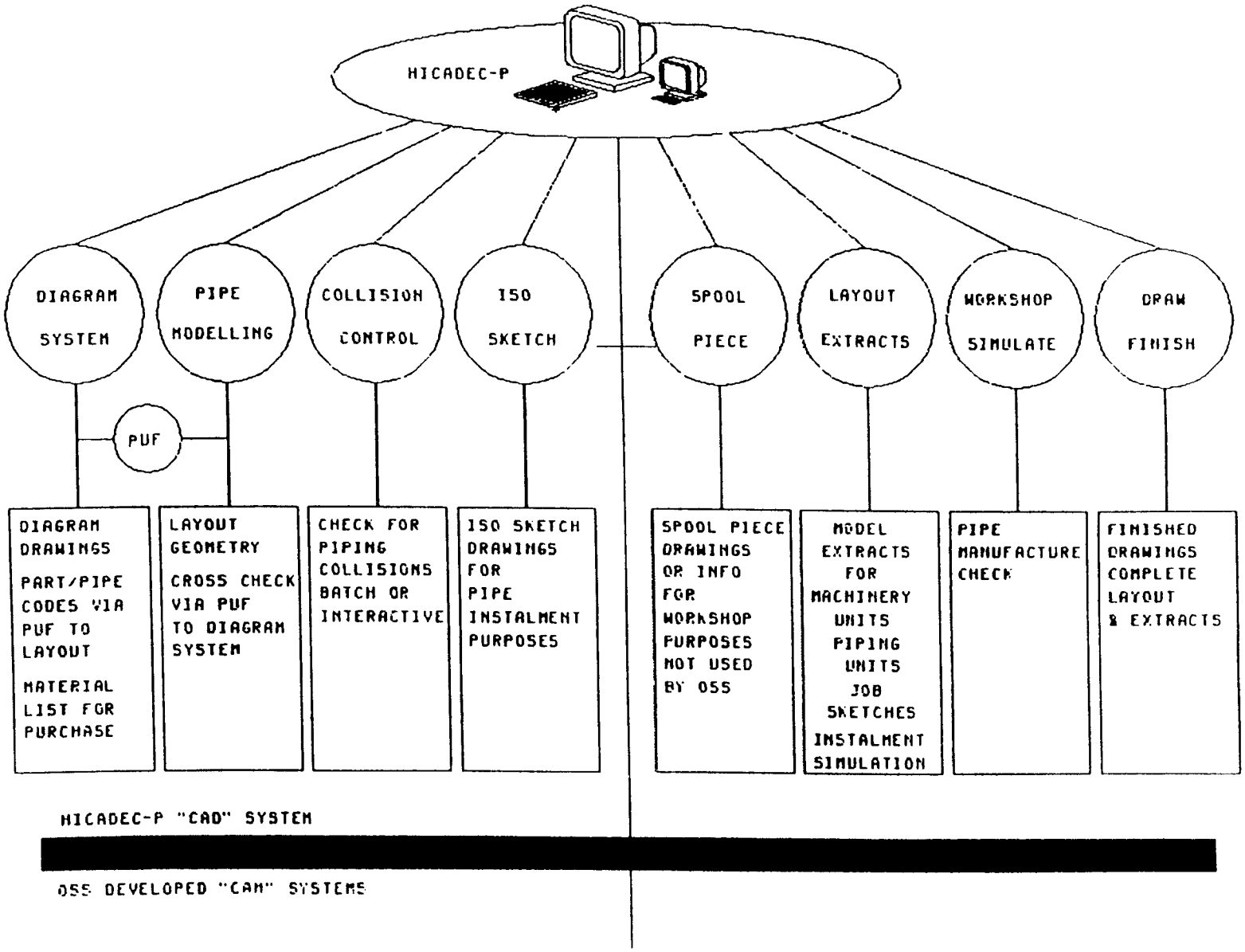
D	
15	21.9 X 3.2
25	33.7 X 4.0
40	48.3 X 4.5
50	60.3 X 4.5
65	76.1 X 5.6
80	88.9 X 5.6
100	114.3X 5.6
125	139.7X 5.6
150	168.3X 6.3
200	219.1X 6.3
250	273.0X 7.1
300	323.9X 7.1
350	355.6X 8.0
400	406.4X 8.0
450	457.2X 8.0
500	508.0X 11.0
600	610.0X 12.5
650	660.4X 12.5
700	711.2X 12.5
750	762.2X 12.5
800	813.0X 12.5

PAGE 1

PIPE MATERIALS

PIPE CODES

HICADEC-P FUNCTIONS & OUTPUTS



INTERNAL MATERIALS

BODY MATERIAL

- A CAST IRON GG-25
- B SG-CAST IRON GGG-40
- C CAST STEEL GS-C25
- D FORGED STEEL
- E CAST IRON GG-25/RUBBER LINED
- F SG-CAST IRON GGG-40/RUBBER LINED
- G CAST STEEL GS-C25/RUBBER LINED
- H BRONZE-RG5
- I BRONZE-RG10
- J BRONZE-RG5/RUBBER LINED
- K BRONZE-RG10/RUBBER LINED
- L STAINLESS STEEL AISI 304
- M STAINLESS STEEL AISI 304L
- N STAINLESS STEEL AISI 316
- O STAINLESS STEEL AISI 316L
- P BRASS
- Q COPPER
- R ALUMINIUM BRASS (YORCALBRO)
- S CARBON STEEL
- T AL.BRONZE

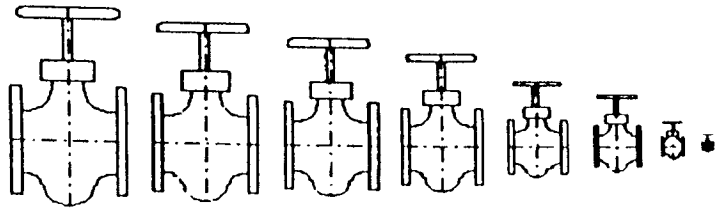
	STEM	DISC/WEDGE/ BALL/DIAPH.	SEAT/ LINING
A	STAINLESS X2CrNi19		
B	STAINLESS STEEL AISI 316		
C	YELLOW METAL	BRONZE-RG5	
D	AL.BRONZE	BRONZE-RG5	
E	AL.BRONZE	BRONZE-RG10	
F	YELLOW METAL	BRONZE-RG10	
G	YELLOW METAL	SPECIAL RUBB.	BRONZE-RG5
H	AL.BRONZE	SPECIAL RUBB.	BRONZE-RG5
I	BRASS	BRASS CROME PLATED	PTFE (TEFLON)
J	STAINLESS STEEL AISI 316		PERBUNAN-N
K	AL.BRONZE	RUBBER FIRE GRADE	BRONZE-RG10
L	STAINLESS STEEL AISI 431		PERBUNAN-N
M	YELLOW METAL	SPECIAL RUBB.	BRONZE-RG10
N	STEEL		PTFE(TEFLON)
O	STAINLESS ST		PTFE(TEFLON)
P	STAINLESS ST	CAST STEEL	STAINLESS ST
Q	STAINLESS STEEL AISI 329		STAINLESS ST AISI 316
R	STEEL		
S	STAINLESS STEEL AISI 431		VITON
T	ST.ST.AISI316	CAST IRON	BRONZE-RG5
U	ST.ST.AISI316	ST.ST.AISI316	AL.BRONZE

REFERENCE NUMBER	BODY	INTERNAL	CLASS CERT.	CONNECTION TYPE	◊VB
01	A	A	NO	MT10	◊VB01
02	A	C	NO	MT10	◊VB02
03	A	C	YES	MT10	◊VB03
04	A	F	NO	MT10	◊VB04
05	B	A	NO	MT10	◊VB05
06	B	A	YES	MT10	◊VB06
07	B	A	NO	MT16	◊VB07
08	B	A	YES	MT16	◊VB08
09	B	B	NO	MT10	◊VB09
10	B	C	NO	MT10	◊VB10
11	B	C	NO	MT16	◊VB11
12	C	A	NO	MT16	◊VB12
13	C	A	YES	MT16	◊VB13
14	C	A	YES	MT40	◊VB14
15	C	B	YES	MT10	◊VB15
16	C	B	YES	MT16	◊VB16
17	C	C	YES	MT40	◊VB17
18	D	A	NO	MT16	◊VB18
19	D	A	YES	MT40	◊VB19
20	M	C	NO	MT10	◊VB20
21	M	C	YES	MT10	◊VB21
22	M	C	NO	MT16	◊VB22
23	M	C	YES	MT16	◊VB23
24	I	B	NO	MT16	◊VB24
25	I	B	YES	MT16	◊VB25
26	I	E	NO	MT10	◊VB26
27	I	E	YES	MT10	◊VB27
28	I	E	NO	MT16	◊VB28
29	I	F	NO	MT10	◊VB29
30	I	F	NO	MT16	◊VB30
31	M	C	NO	MT16	◊VB31
32	I	B	NO	MT10 (ex.ex.bolts)	◊VB32
33	C	A	NO	MT25	◊VB33
34	C	A	YES	MT25	◊VB34
35	I	E	NO	MT10 (ex.ex.bolts)	◊VB35
36					
37	M	D	NO	MT10	◊VB37
38					
39					
40	I	E	NO	STORZ COUP.MT16	◊VB45
41					
42					
43	M	C	NO	SCREW 10	◊VB51
44	M	B	NO	SCREW 16	◊VB52
45	I	B	NO	SCREW 10	◊VB53
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					

GLOBE VALVE

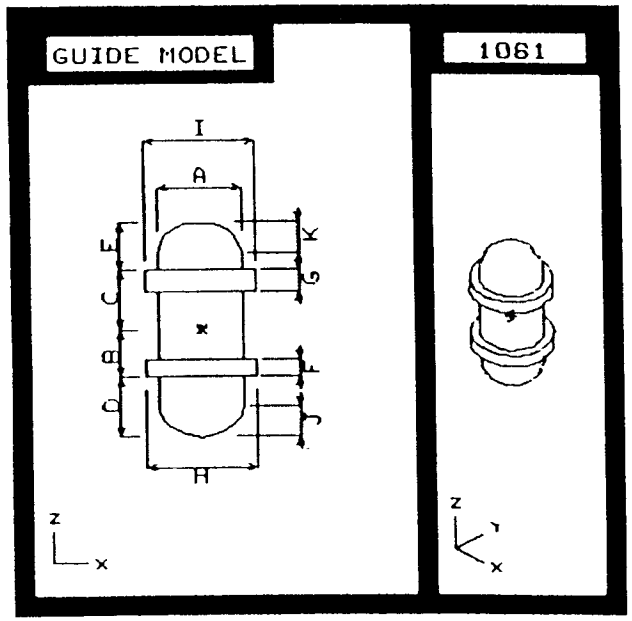
PARTS DEFINITION

(CATALOGUE)

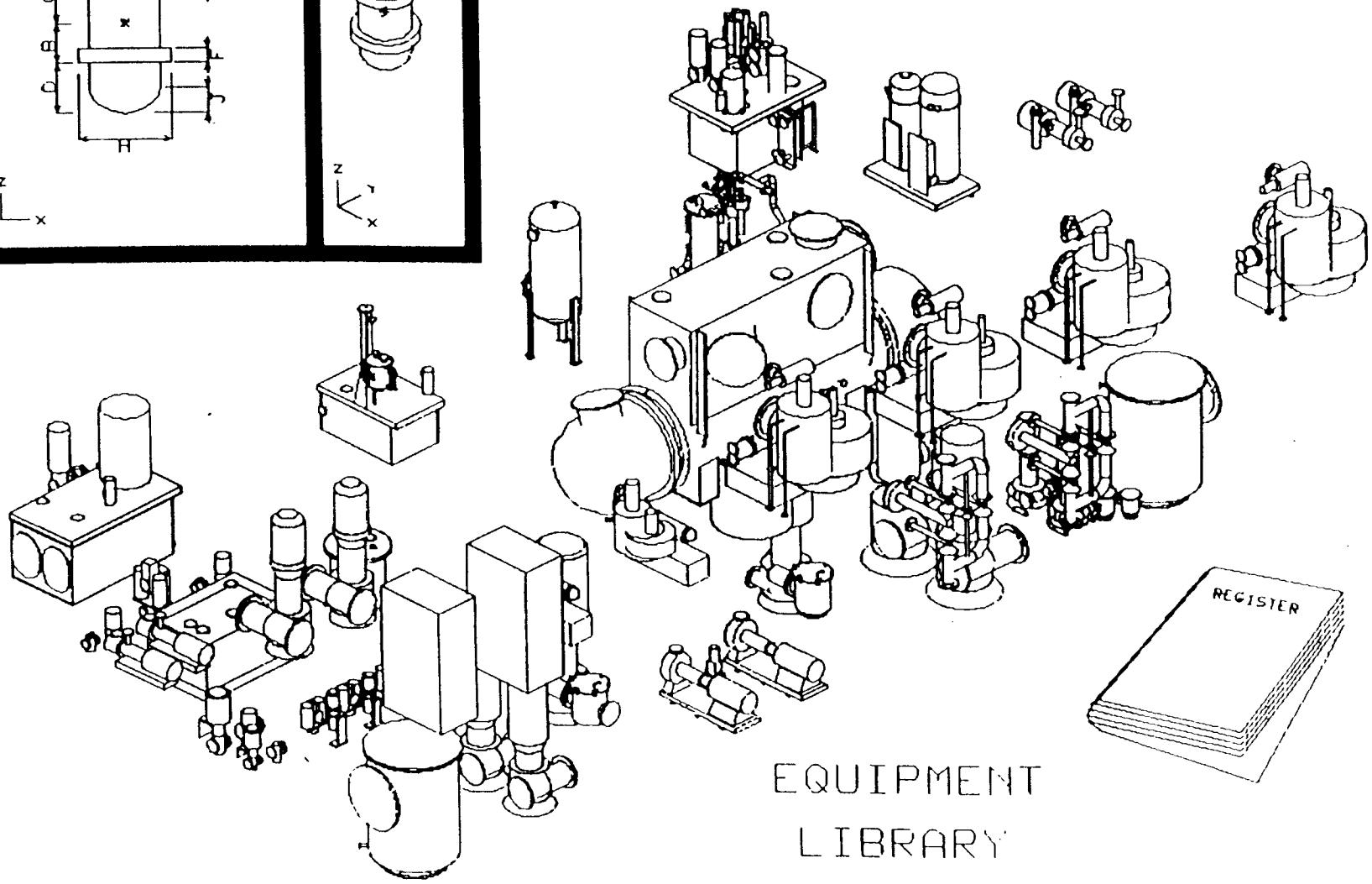


PART RANGE

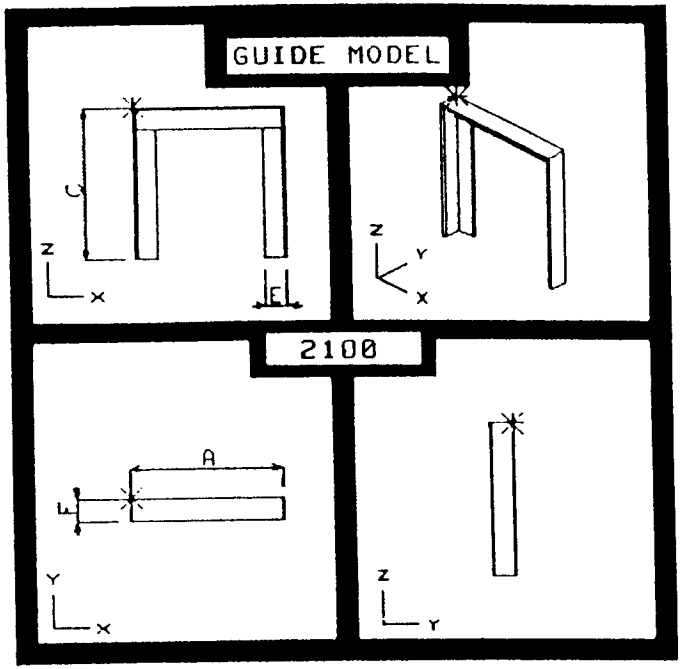
PART NAMES



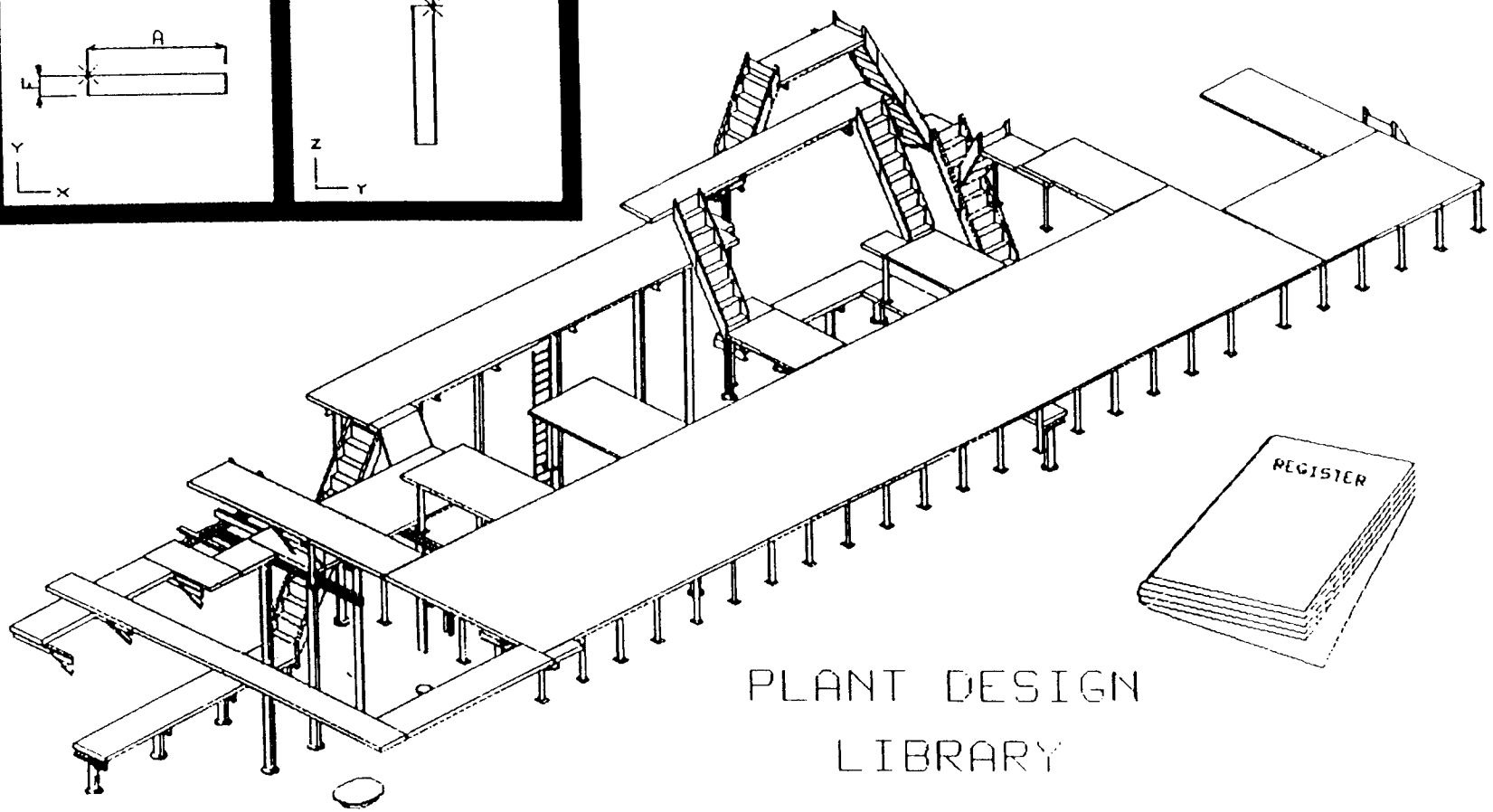
EQUIPMENT MODELLING COMBINATION OF PRIMITIVE FIGURES



EQUIPMENT LIBRARY

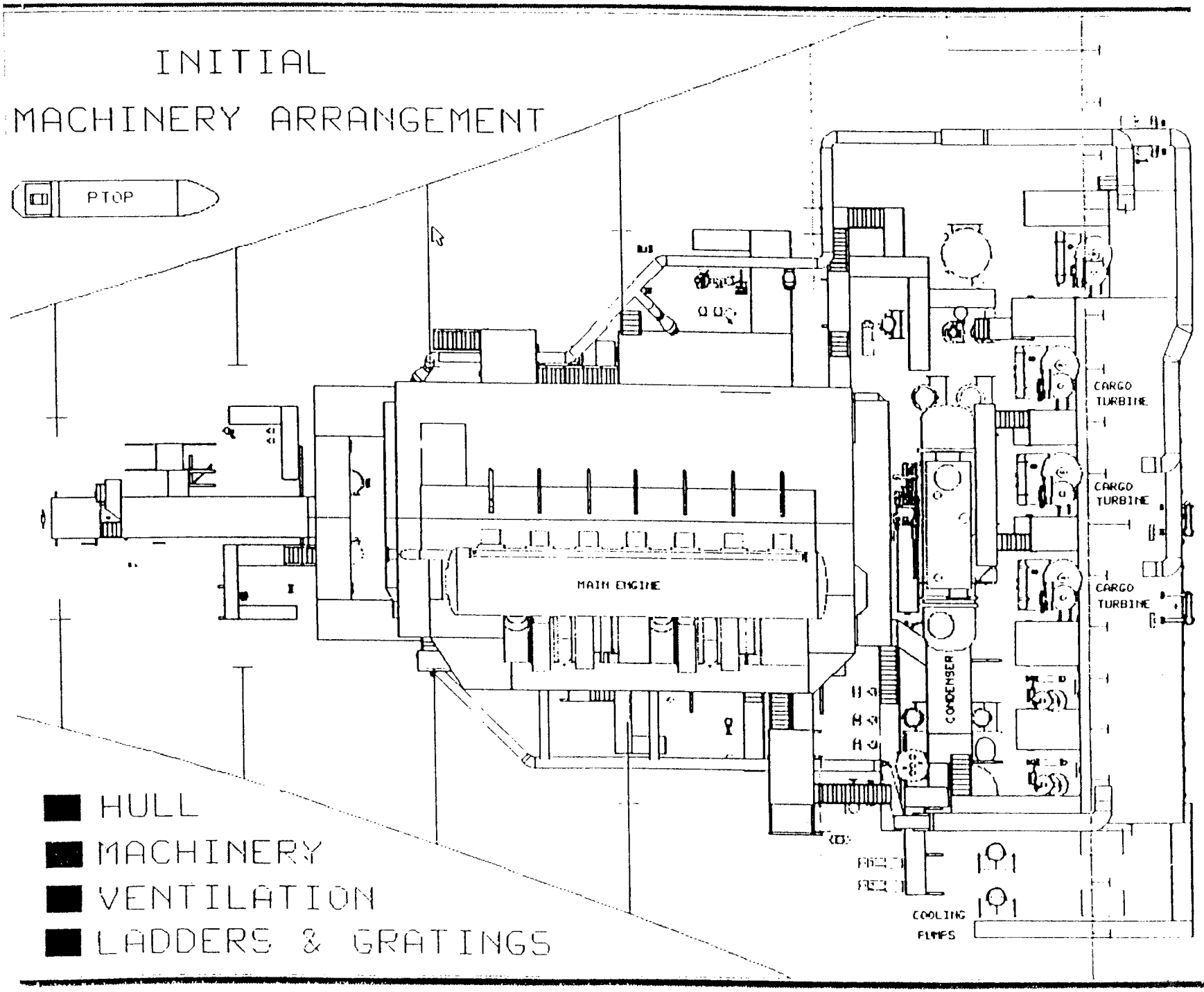


PLANT DESIGN COMBINATION OF PRIMITIVE FIGURES



PLANT DESIGN LIBRARY

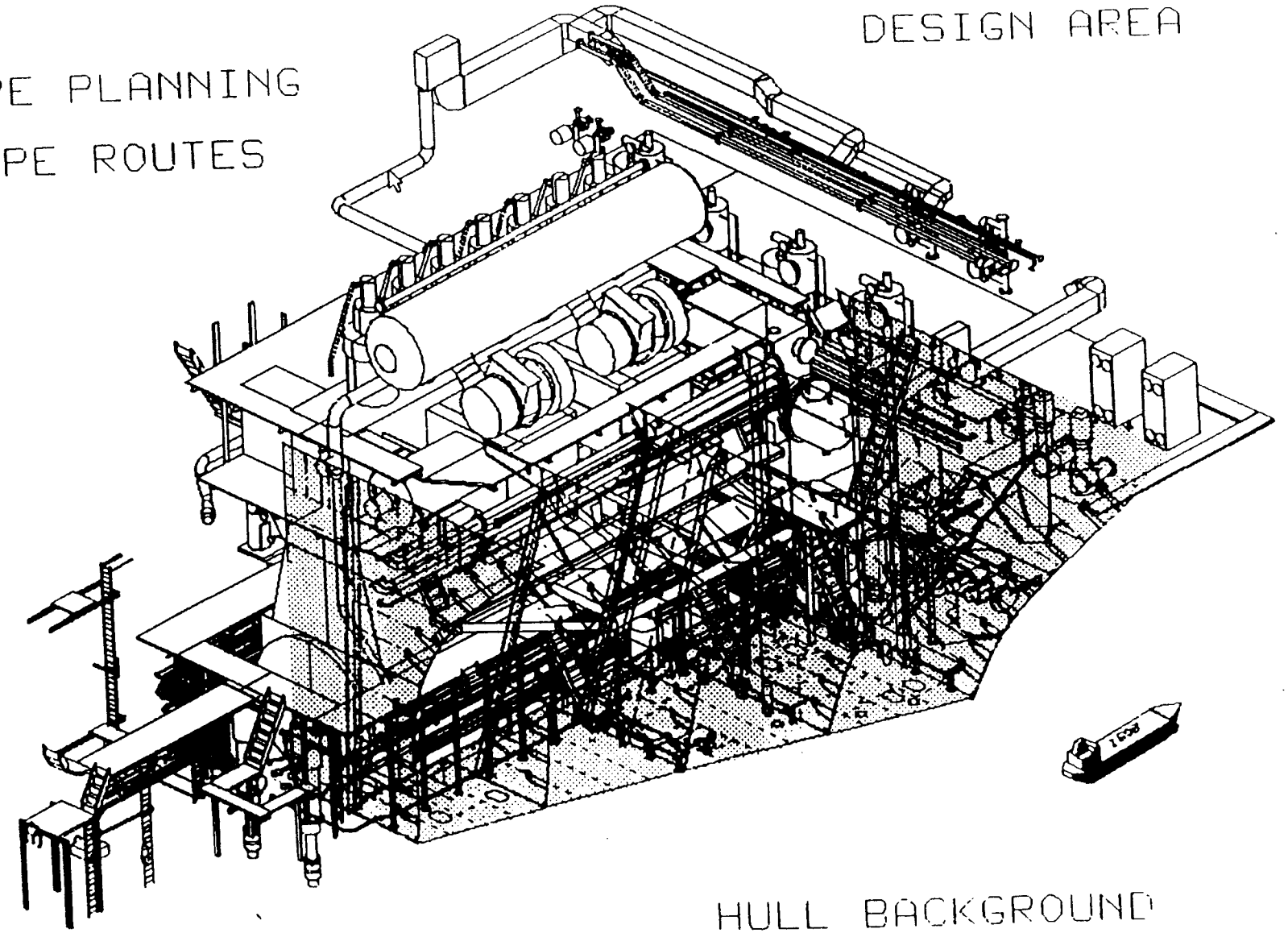
INITIAL MACHINERY ARRANGEMENT



PIPE PLANNING

PIPE ROUTES

DESIGN AREA



HULL BACKGROUND

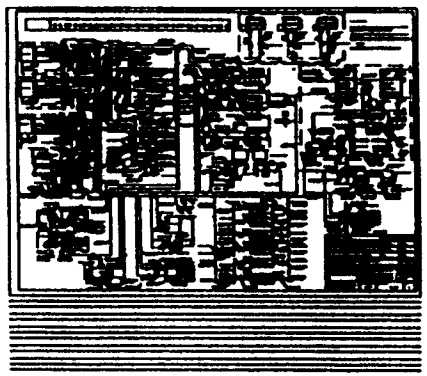


DIAGRAM
SYSTEM

SYSTEM
CHECK

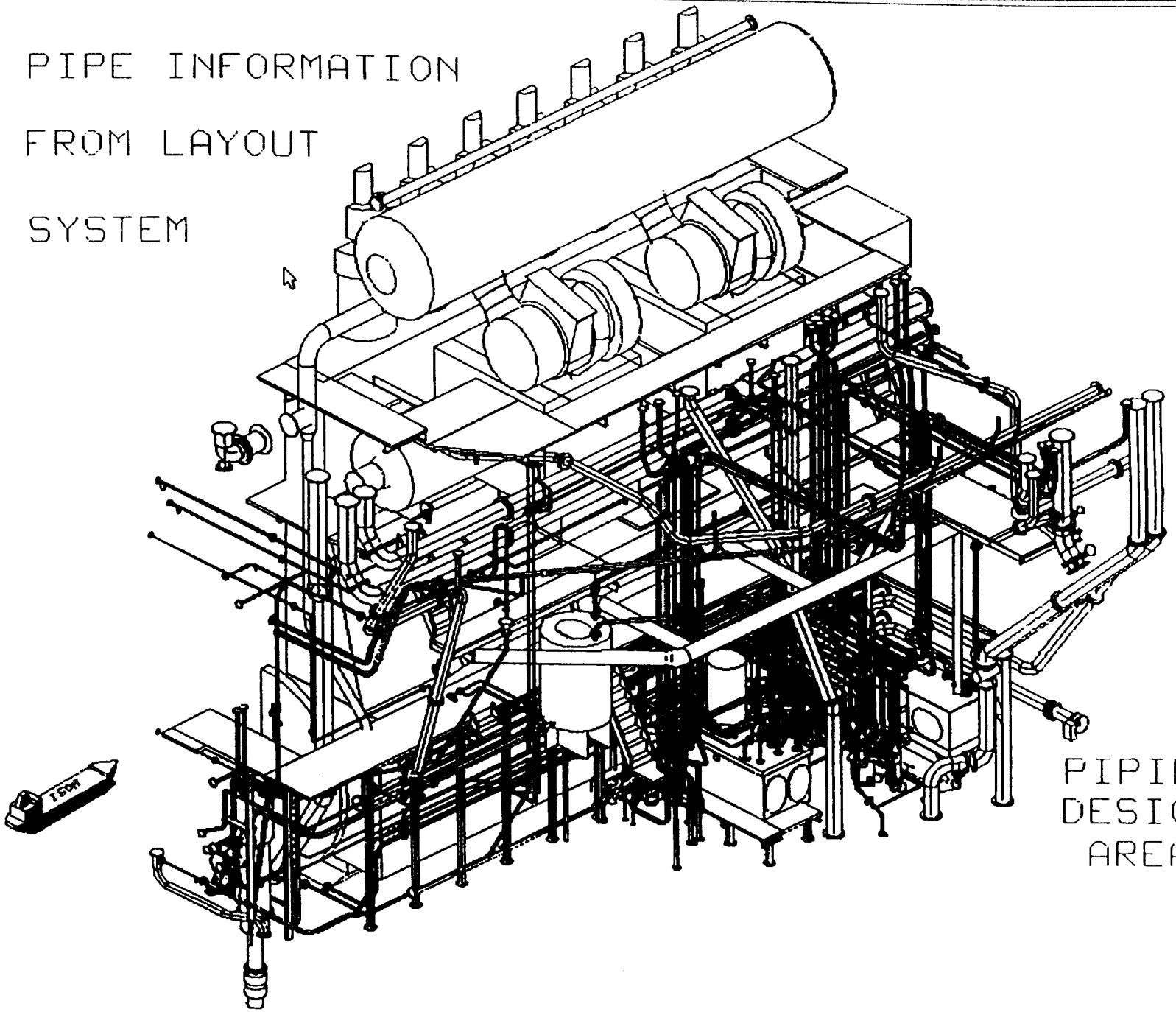
PIPING
DESIGN
AREA

DIAGRAM / LAYOUT CROSS CHECK

PIPE INFORMATION

FROM LAYOUT

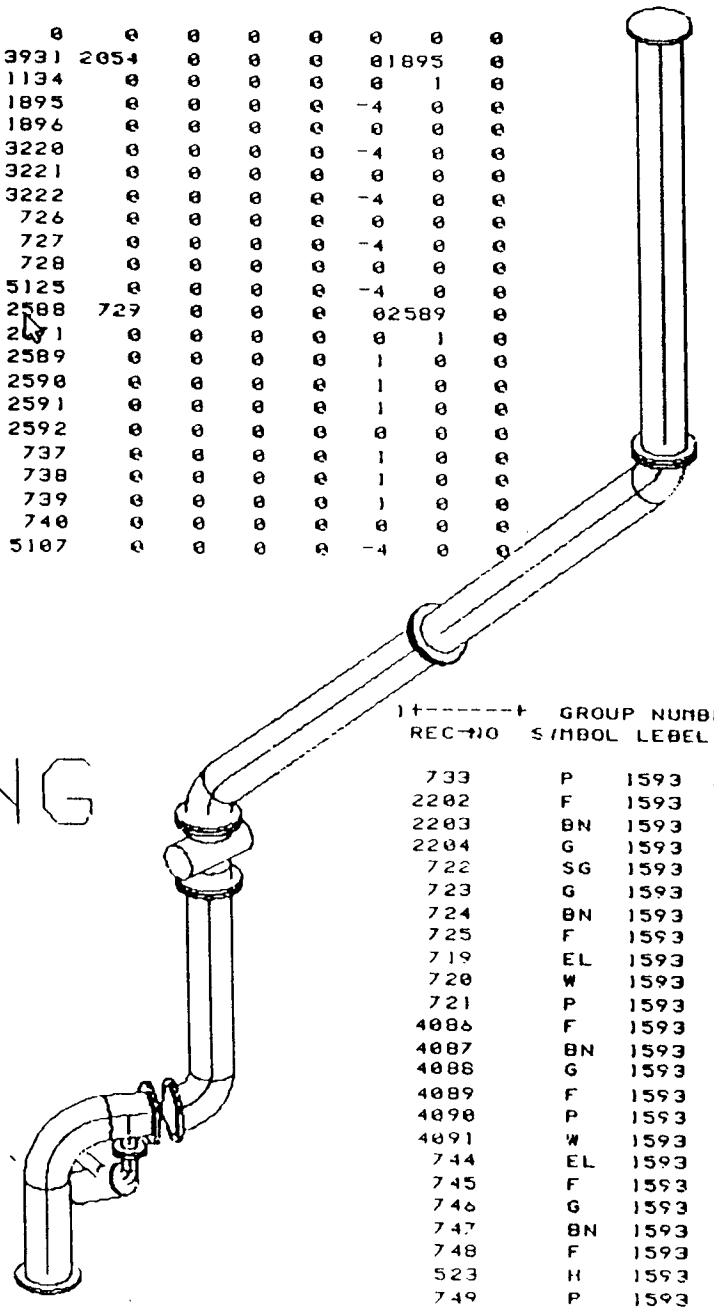
SYSTEM



PIPING
DESIGN
AREA

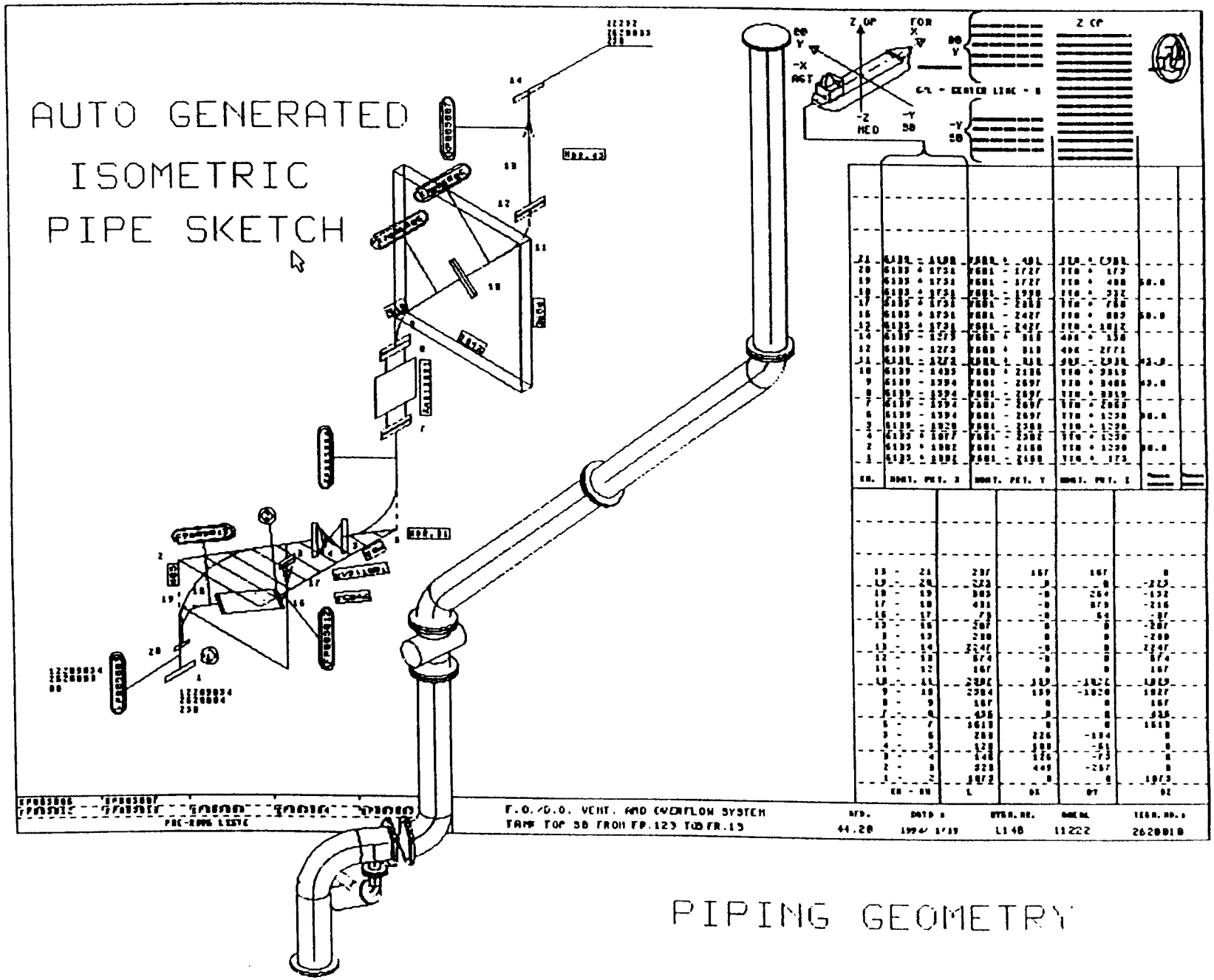
PIPING DATA

PIPING DATA



REC-NO	SYMBOL	LEBEL	NEXT	FORE	REFERENCE-CHAIN				AUTO	IMO	FIT
GROUP NUMBER = 603											
3931	F	1654	1134	0	0	0	0	0	0	0	0
1134	H	1655	1895	3931	2054	0	0	0	0	1895	0
1895	P	1655	1896	1134	0	0	0	0	0	1	0
1896	W	1655	3228	1895	0	0	0	0	-4	0	0
3220	EL	1654	3221	1896	0	0	0	0	0	0	0
3221	W	1654	3222	3220	0	0	0	0	-4	0	0
3222	EL	1654	726	3221	0	0	0	0	0	0	0
726	W	1653	727	3222	0	0	0	0	-4	0	0
727	P	1653	728	726	0	0	0	0	0	0	0
728	W	1653	5125	727	0	0	0	0	-4	0	0
5125	ES	1593	2588	728	0	0	0	0	0	0	0
2588	W	1593	2071	5125	0	0	0	0	-4	0	0
2071	H	1593	2589	2588	729	0	0	0	0	2589	0
2589	P	1593	2590	2071	0	0	0	0	0	1	0
2590	F	1593	2591	2589	0	0	0	0	1	0	0
2591	BN	1593	2592	2590	0	0	0	0	1	0	0
2592	G	1593	737	2591	0	0	0	0	1	0	0
737	VC	1593	738	2592	0	0	0	0	0	0	0
738	G	1593	739	737	0	0	0	0	1	0	0
739	BN	1593	740	738	0	0	0	0	1	0	0
740	F	1593	5107	739	0	0	0	0	1	0	0
5107	ES	1593	732	740	0	0	0	0	0	0	0
732	W	1593	733	5107	0	0	0	0	-4	0	0

REC-NO	SYMBOL	LEBEL	NEXT	FORE	REFERENCE-CHAIN				AUTO	IMO	FIT
GROUP NUMBER = 603											
733	P	1593	2202	732	0	0	0	0	0	0	0
2202	F	1593	2203	733	0	0	0	0	1	0	0
2203	BN	1593	2204	2202	0	0	0	0	1	0	0
2204	G	1593	722	2203	0	0	0	0	1	0	0
722	SG	1593	723	2204	0	0	0	0	0	0	0
723	G	1593	724	722	0	0	0	0	1	0	0
724	BN	1593	725	723	0	0	0	0	1	0	0
725	F	1593	719	724	0	0	0	0	1	0	0
719	EL	1593	720	725	0	0	0	0	0	0	0
720	W	1593	721	719	0	0	0	0	-4	0	0
721	P	1593	4086	720	0	0	0	0	0	0	0
4086	F	1593	4087	721	0	0	0	0	1	0	0
4087	BN	1593	4088	4086	0	0	0	0	1	0	0
4088	G	1593	4089	4087	0	0	0	0	1	0	0
4089	F	1593	4090	4088	0	0	0	0	0	0	0
4090	P	1593	4091	4089	0	0	0	0	0	0	0
4091	W	1593	744	4090	0	0	0	0	-4	0	0
744	EL	1593	745	4091	0	0	0	0	0	0	0
745	F	1593	746	744	0	0	0	0	0	0	0
746	G	1593	747	745	0	0	0	0	1	0	0
747	BN	1593	748	746	0	0	0	0	1	0	0
748	F	1593	523	747	0	0	0	0	1	0	0
523	H	1593	749	748	743	0	0	0	0	749	0
749	P	1593	750	523	0	0	0	0	0	1	0


AUTO GENERATED
ISOMETRIC
PIPE SKETCH
F.O./O.O. VENT. AND OVERFLOW SYSTEM
TANK TOP 3B FROM FR.123 TO FR.15
44.28
11222
2620818
PIPING GEOMETRY

OSTK02 P A R T L I S T S Y S T E M 89/08/15

LOOM P A R T L I S T L I N E - B A S I S D A T A 12:52:26

TR-TYPE: V NON COPY : LTERM: BA61 DATE:890426 CODE: R

SHIP NO: 148 DRAWING : 148-PD2-620

POS.NO : KP005003 LINE : 000 ALTERED :

NO.OFF : 001 QUANTITY : 01744 UNITS : MM

TITLE : PREROR TYPE :

ORIGIN : 31 IDENT NO.: KP005003 ORDER NO: 00000

DRG.NO.: 11222 ERECT.DRG: 2620010

ACCOUNT: 0002620 TOTAL KG.: 000102 SURFACE : IN 00 OUT 45

OPKO : AA DIMENS : 00250 00000 00000 00000

ERECT.A	REGION	ACTIV	LOC	P
ACTUAL:	1122	227	226	T
ORIGIN:	1122	227		
SERIE:	1122	227	226	T

INSTALL
404
+WEEKS
000

M A T E R I A L S T A T U S

FABRI	TO	FROM	IN	OUT	INSTALL
CATED	TREAT	TREAT	STOCK	DATE	FINISH
31222	40103	40107	40110	40114	40124

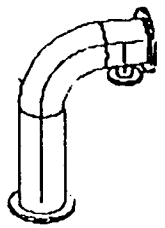
LTERM LOON DATE 931109 CODE R

FLOW ST.WEEK ALT. MRK DELIV. PRTIME AREA

000 B

TIME FAC: +002.75 TOTTIME :+0000002.75 LTERM BATC DATE 931102 CODE N

(PIPE SPOOL)



PART LIST DATA

********** UNIT	KONTO	AFD.	SKIB	BLOK	ANTAL	LB.NR.	AENDR	BEHBLOK-AKT
* RORSKITSE *								DATO: 21/12/93 (BASIS.L14B)
**********		2620	BD.22	L14B			003	

ROR SYSTEM: FO VENT & OVERFLOW SYSTEM POS NO : KP 005 AENDR.AF:

BEHANDLING: 00452B INDVENDIG: INGEN BEHDL. UDVENDIG: EPOXYPRIMER AFDAEKNING: INGEN AFD: PRELAGER
AAAD010N MONSTER: 3 NO: 250

1- 2	250	ST35	273.0 X 7.10	VARENR:	B62664	LGT:	682/
2- 3- 5	250	ST35	273.0 X 7.10	VARENR:	B62664	LGT:	276/
3- 4	80	ST35	88.9 X 5.60	VARENR:	B62581	LGT:	229/ 99

WGT: 102.7KG

BEMAERKNINGER	KNUDE	TYPE	OS-NO.	VARE NO(S)	FLG.NORM
	1	FLFT	3002 NT10-250	310329/	
	2	S323	NO=250	B12: 364	300214
	3	STUD			TYPE:
	4	FLFT	3002 NT10- 80	310176/	
	5	FLFT	3002 NT10-250	310329/	

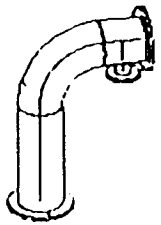
OVERFLADE AREALER. INDVENDIG: 1.97 KVD.M. UDVENDIG: 2.45 KVD.M.

OPR.OMRADE	OPRSTD	JOB.NR.	OPR.NR.	PRIS	TILLAEG	BEMAERK	OPR.OMRADE	ORPSTD	JOB.NR.	OPR.NR.	PRIS	TILLAEG
RUNDSAV				2571			BUK MASK					
BRANMASK				2551			SMLEPLAN				2554	
FLSVMASK							SVEJPLAN				2556	

1 AFKORTNINGER, 4 BRAENDINGER, 0 FLANGESVEJSNING, 0 BUKNING1, 0 BUKNING2, 7 SAMLINGER, 7 SVEJSE MM.

ANTAL: BLOK: ROR: KP 005003 SKIB: L14B

(PIPE SPOOL)



PIPE

WORKSHOP INFORMATION

PRODUCTION LINE

ANTAL: BLOK: ROR: KP 005003 SKIB: L148

BLVED EN BOJNING ER ANGIVET FOLGENDE FIRE VAERDIER :
1)AFSTAND I MM FRA EN REFERENCE KNUDE / REFERENCE KNUDENUMMER
2)ROTATIONSVINKEL I GRADER (+ FOR MED UR, - FOR MOD UR)
3)BOJNINGSVINKEL I GRADER (VENSTRE BOJNING)
4)SPRING (I MM) AF REFERENCE KNUDE EFTER BOJNING)
LAENGDER MELLEM KNUDER ER SANDE LAENGDER I MM.

RONTGEN: NEJ MPI: NEJ

PAMONTERING AF STUDS :
KOORDINATER FOR KNUDE(R) 4
NULPUNKT VED KNUDE 3*-->(Y-RETN)

3------4

STUDS:	B.	KN.NR.	X-ORD	Y-ORD	Z-ORD
	90.	4	0	238	0

2...1

FLANGE STILLING

2...5
!31.
!())
1
FL

3...2
!31.
!())
4
FL

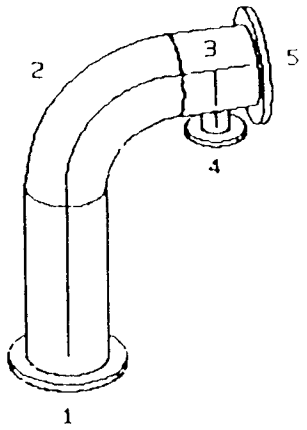
1...2
0. !
!
5
FL

4
! FLFT
!
238!

1075 SB 522 ! 147

1----------2----------3----------5

FLFT 1066/ 1 STUD FLFT
0
90
1067

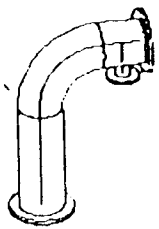


---------- KONROLNAL FOR KNUDE NR. 5 ----------

KNUDER 1 2 5 ANGIVER PLAN *
X-AKSE DANNES AF KNUDER 1 2 * X-ORD Y-ORD Z-ORD
Y-AKSE I PLAN ; Z-AKSE OPAD * 1075 669 0
NULPUNKT VED KNUDE 1 *

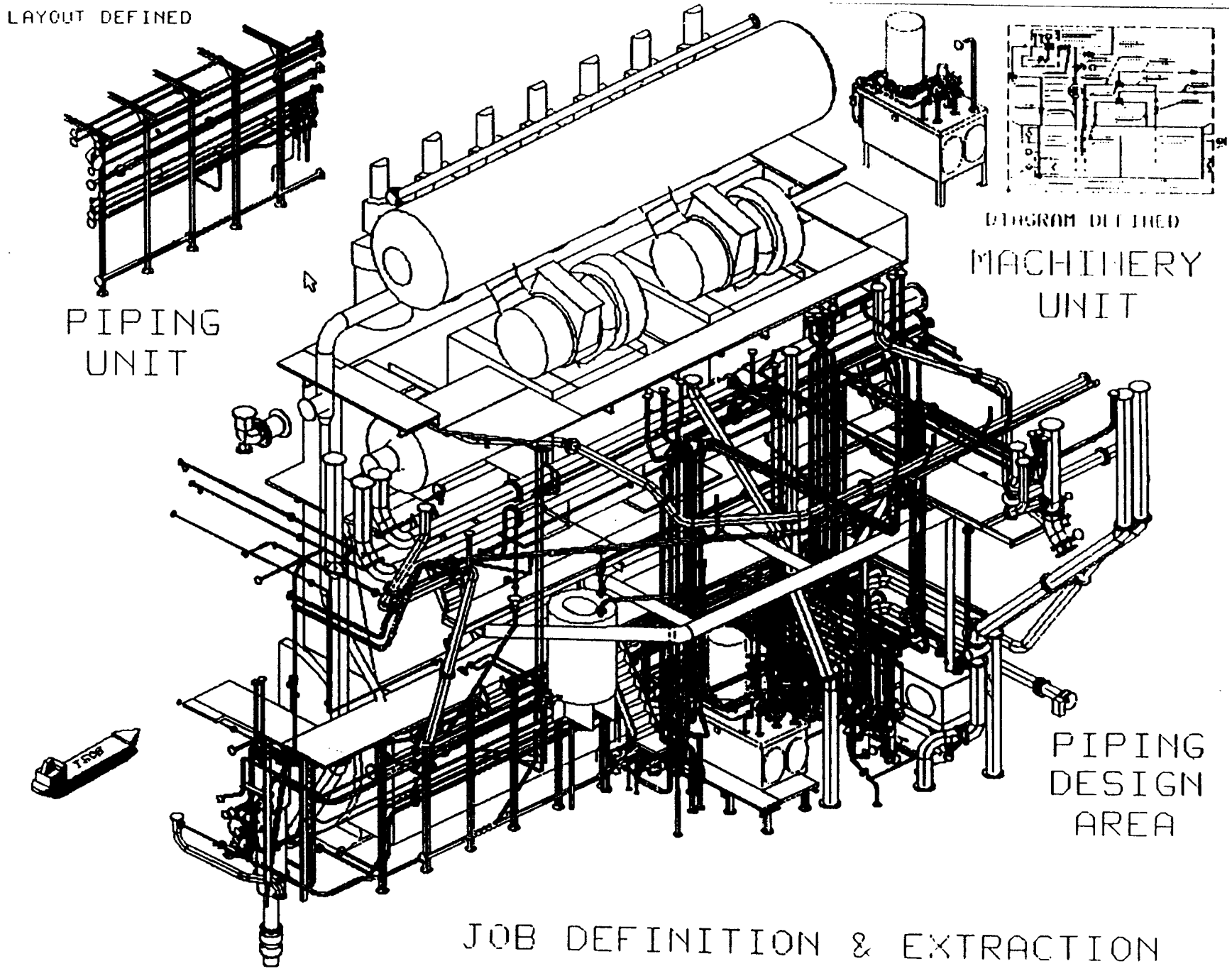
(PIPE SPOOL)

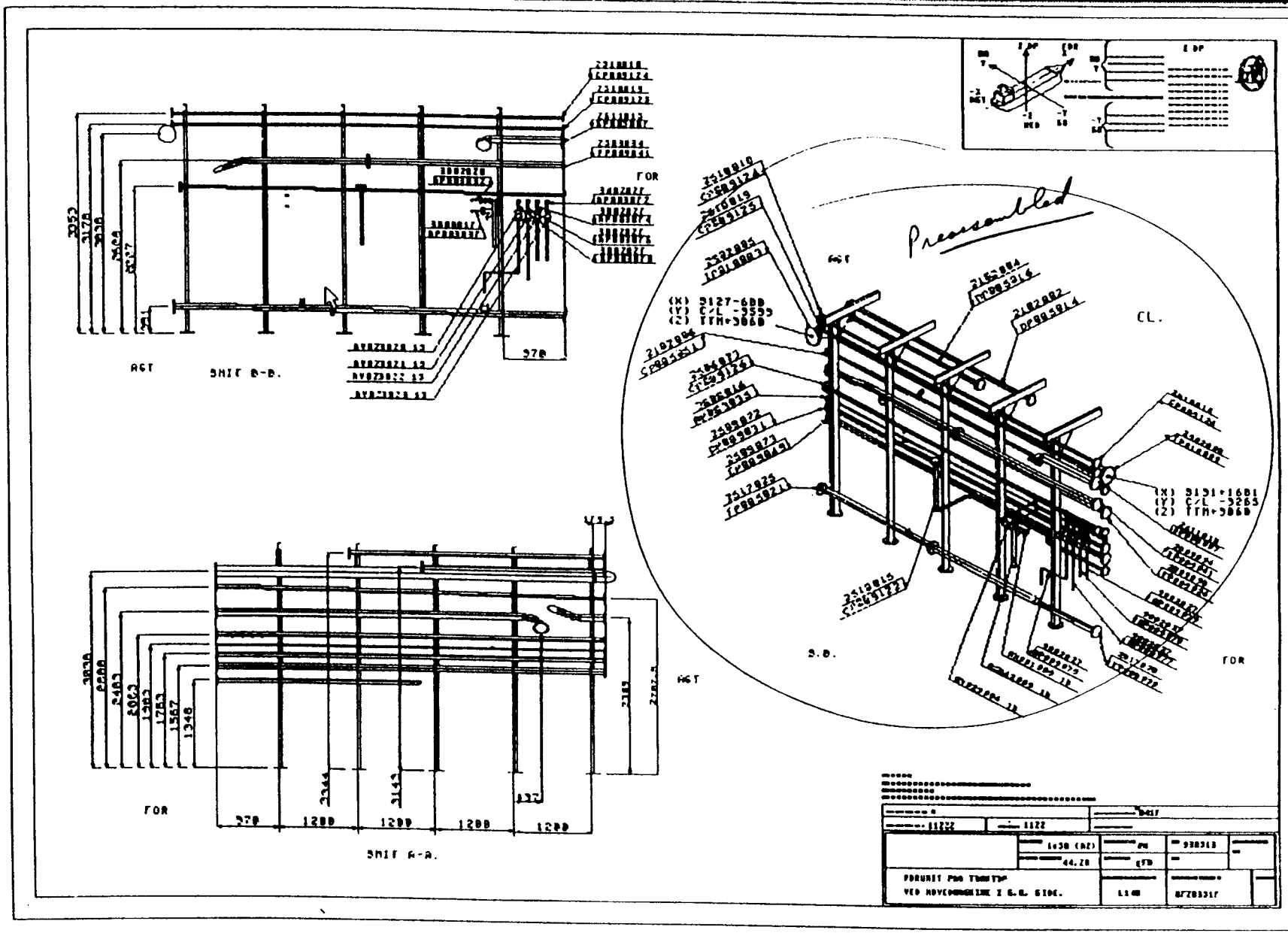
PIPE



WORKSHOP INFORMATION

GEOMETRY


LAYOUT DEFINED
PIPING
UNIT
MACHINERY
UNIT
PIPING
DESIGN
AREA
JOB DEFINITION & EXTRACTION


Preassembled
CL.
AGT
FOR
DRAW FINISH
PIPE UNIT EXTRACTION
FROM LAYOUT MODEL

21/01/94 RAP1 ----> LISTE FOR KONTROL <---- (MONT1412)

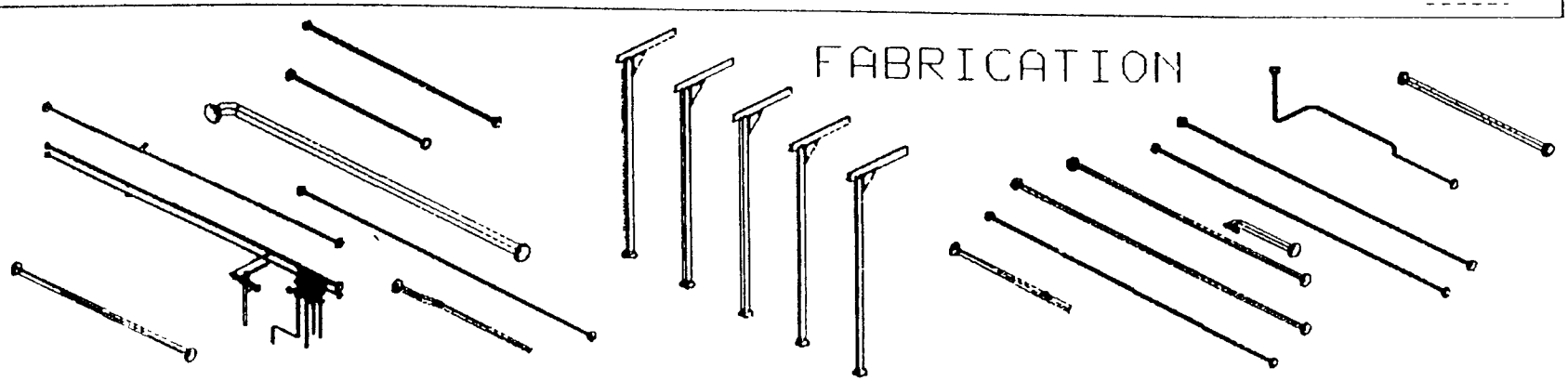
JOBNR: 47027 OPR. VIA STKSYS. 93090 AFD: 1410 NYB 14B SEKO: 0417 HAK:220 DAK:610 PALLE: 1 VF.ER: LJN

MATERIALESTATUS PR 940114: 0 STK SKIBSVARE I MANKO 0 STK STANDARDVARE I MANKO 31 STK ROR I MANKO

LEV.STED: *10 DATO: REKVIRERET AF: DATO:

START PLANLAGT TIL: 940224 SLUT PLANLAGT TIL: 940316 PROD START: PROD SLUT: MONTUGE: 406 OPFLAFD: 1410

TEGN	TOTTID	POSITION	LN	IDENT	BETEGNELSE	DIM	ANT	MGD	EH	MONTTEGN	FK	ORDRE	VAERKTEGN	VGT
14B PD2 102	0.77	CP005051	00	CP005051	PREROR	40	1	6002	MM	2102006	31	00000	11222	34
14B PD2 102	0.77	DP005014	00	DP005014	PREROR	50	1	3937	MM	2102002	31	00000	11222	29
14B PD2 102	0.77	DP005016	00	DP005016	PREROR	50	1	2817	MM	2102004	31	00000	11222	22
14B PD2 102	2.31													85
14B PD2 503	0.86	FP009023	00	FP009023	PREROR	60	1	3072	MM	2503034	31	00000	11222	42
14B PD2 503	0.86	FP009024	00	FP009024	PREROR	60	1	5280	MM	2503035	31	00000	11222	66
14B PD2 503	0.86	FP009041	00	FP009041	PREROR	60	1	3000	MM	2503034	31	00000	11222	41
14B PD2 503	2.58													149
14B PD2 506	0.77	CP009126	00	CP009126	PREROR	40	1	5876	MM	2506023	31	00000	11222	33
14B PD2 506	0.77													33
14B PD2 509	0.77	DP009031	00	DP009031	PREROR	50	1	6000	MM	2509072	31	00000	11222	41
14B PD2 509	0.86	EP009049	00	EP009049	PREROR	65	1	5992	MM	2509073	31	00000	11222	64
14B PD2 509	1.63													105
14B PD2 510	0.77	CP009122	00	CP009122	PREROR	40	1	4843	MM	2510015	31	00000	11222	26
14B PD2 510	0.77	CP009124	00	CP009124	PREROR	40	1	6000	MM	251001B	31	00000	11222	32
14B PD2 510	0.77	CP009125	00	CP009125	PREROR	40	1	6000	MM	2510019	31	00000	11222	32
14B PD2 510	2.31													90



21/01/94 RAP1 ----> LISTE FOR KONTROL <---- (MONT1412) PAGE 1

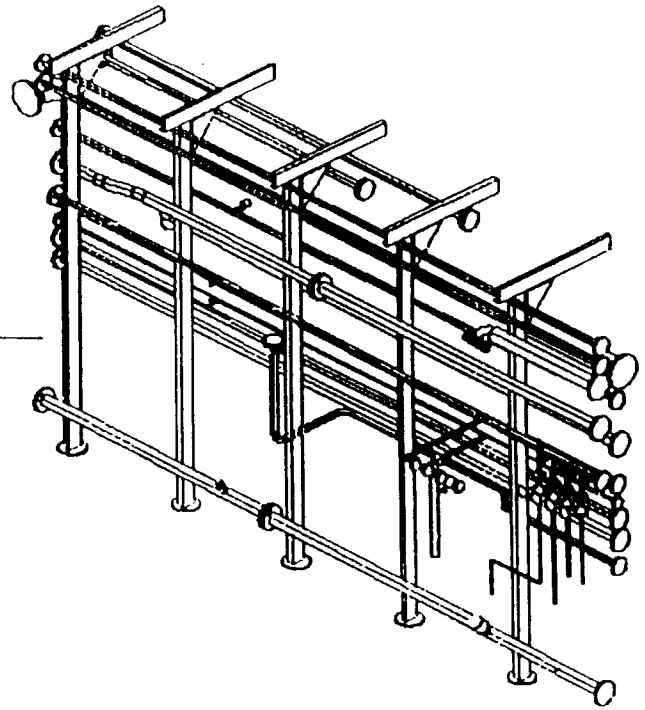
JOBNR: 55582 OPR. VIA STKSYS. 93112 AFD: 1410 NYB 148 SEKO: 1122 HAK:227 DAK:623 PALLE: 1 VF.ER: AA

MATERIALESTATUS PR 940114: 0 STK SKIBSVARE I MANKO 0 STK STANDARDVARE I MANKO 0STK ROR I MANKO

LEV.STED: DATO: REKVIRERET AF: DATO:

START PLANLAGT TIL: 940224 SLUT PLANLAGT TIL: 940316 PROD START: PROD SLUT: MONTUGE: 40B OPFLAFD: 1410

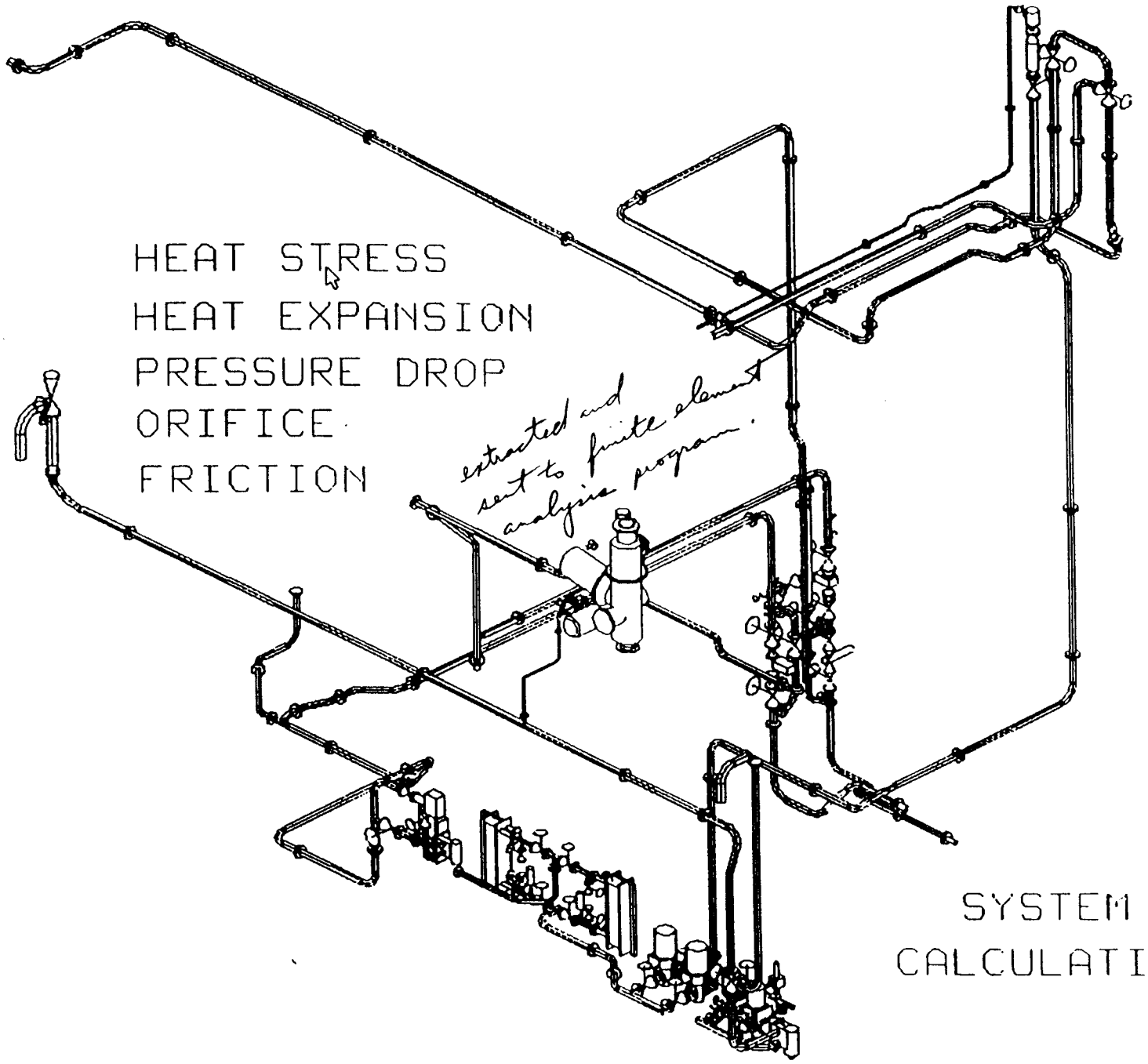
TEGN	TOTTID	POSITION	LN	IDENT	BETEGNELSE	DIM	ANT	MGD	EH	MONTTEGN	FK	ORDRE	VAERKTEGN	VGT
14B07203514	6.80	0414	00	0414	MONT.RORUNIT 0414	0	1	0		07203514	40	00000		0
14B07203514	6.80													0
14B07203515	6.80	0415	00	0415	MONT.RORUNIT 0415	0	1	0	ST	07203515	40	00000		0
14B07203515	6.80													0
14B07203517	6.80	0417	00	0417	MONT.RORUNIT 0417	0	1	0	ST	07203517	40	00000		0
14B07203517	6.80													0
14B07203574	6.80	0474	00	0474	MONT.RORUNIT 0474	0	1	0	ST	07203574	40	00000		0
14B07203574	6.80													
GRAND TOTAL	27.20													



INSTALLATION

SCHEDULES

0417


HEAT STRESS
HEAT EXPANSION
PRESSURE DROP
ORIFICE
FRICTION
extracted and sent to finite element analysis program.
SYSTEM CALCULATIONS

Attachment (D)

Odense Steel Shipyard Ltd.

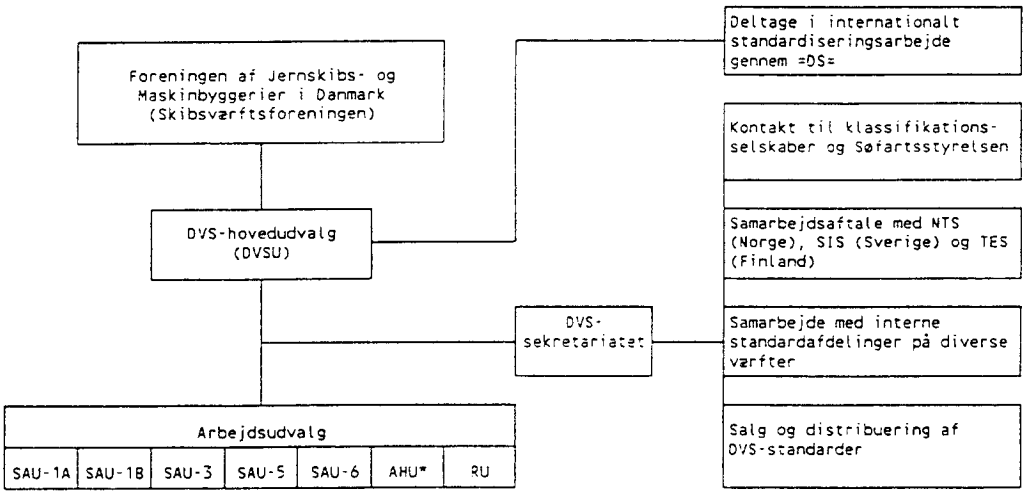
DVS Standards Organization Handout

Danske Værfters Standardiseringsudvalg, DVS
Organisation og arbejdsområde

DVS er en organisation oprettet af Skibsværftsforeningen som et led i bestræbelserne på at styrke danske værfters konkurrenceevne.

1. Organisation

DVS's organisation er vist i nedenstående organisationsplan, denne viser også viser DVS's eksterne kontakter.



* Ad hoc-udvalg efter behov

1.1 DVS-hovedudvalget (DVSU)

DVS-hovedudvalg består af repræsentanter for Skibsværftsforeningen, Odense Staalskibsværft A/S, Danyard A/S, Burmeister & Wain Skibsværft A/S og MAN B&W Diesel A/S.

DVS-sekretariatets leder virker som sekretær for DVSU.

Indenfor det af Skibsværftsforeningen godkendte budget fastlægger DVSU retningslinierne for DVS's arbejde, fordeler og prioriterer opgaver til arbejdsudvalgene og godkender nye standarder, inden de udsendes.
DVSU er ansvarlig overfor Skibsværftsforeningen for DVS's drift, herunder for overholdelse af budgettet.

1.2 Arbejdsudvalgene

Standardiseringsarbejdet foregår i et antal Standardiserings Arbejdsudvalg (SAU). Endvidere findes et Revisionsudvalg (RU), som holder eksisterende standarder ajour.

Udvalg	Formandskab	Fagområde
SAU-1A	Danyard A/S	Skibsudrustning
SAU-1B	Odense Staalskibsværft A/S	VVS og brandsikring
SAU-3	Danyard A/S	Stålkonstruktioner
SAU-5	Odense Staalskibsværft A/S	El-instrumenteringsteknik
SAU-6	Burmeister & Wain Skibsværft A/S	Maskinudrustning - rør
RU	Burmeister & Wain Skibsværft A/S	Revision af DVS-standarder

DVSU kan yderligere nedsætte ad hoc-udvalg til behandling af specielle emner.

Når en ny sag skal startes i et arbejdsudvalg, udsender sekretariatet indbydelse til Skibsværftsforeningens medlemsværfter med hensyn til at deltage i udvalgets arbejde. Derudover kan et udvalg efter behov supplere sig med ekstern ekspertise, f.eks. fra myndigheder eller leverandører.

DVS-sekretæren deltager i arbejdsudvalgenes møder.

1.3 Sekretariatet

Sekretariatet ledes af en sekretær, der er ansvarlig overfor DVSU for sekretariatets arbejde.

Sekretæren fungerer som sekretær for DVSU og deltager i arbejdsudvalgenes møder.

Sekretariatets arbejdsopgaver :

- redigering og rentegning af oplæg fra arbejdsudvalgene,
- trykning og udsendelse af standarder til kritik, samling af indkommet kritik,
- trykning og udsendelse af færdige standarder,
- salg af standarder, abonnementer,
- varetage eksterne kontakter (se organisationsplan),
- samarbejde med værfternes interne standardafdelinger.

2. Målsætning

Det er DVS's hovedmål at udarbejde DVS-standarder således, at der ved standardernes udarbejdelse, teknisk og økonomisk, tilstræbes en optimal løsning, som tilgodeser rederiers og værfters interesser.

DVS's målsætning, politikker og styringsmodel er i øvrigt fastlagt i DVS 00004.

3. Typer af standarder

DVS lægger hovedvægten på udvikling af standarder med højt teknologisk indhold, herunder standarder for systemudformninger og beregninger. De eksisterende enkle komponentstandarder vil blive holdt ajour, og i det omfang det skønnes formålstjenligt, omformet fra detaljerede produktionsstandarder til ydeevnestandarder (performance standard).

4. Sagsbehandling

Rutiner ved sagsbehandling i forbindelse med udvikling og revision af standarder er beskrevet i DVS 00003.

5. Distribuering af DVS-standarder

DVS-standarder forhandles af sekretariatet dels i løssalg af enkelte standarder, dels som komplette mappesæt.

Ved køb af komplet mappesæt tegnes samtidig abonnement på nye og reviderede standarder, som automatisk vil blive tilsendt fra sekretariatet til en favørpris.

Sekretariatet er til disposition med oplysninger om priser etc.

Enclosure (2)

Odense Steel Shipyard Ltd.

Aerial View

Tomorrow's shipbuilding technology

Enclosure (3)

Odense Steel Shipyard Ltd.

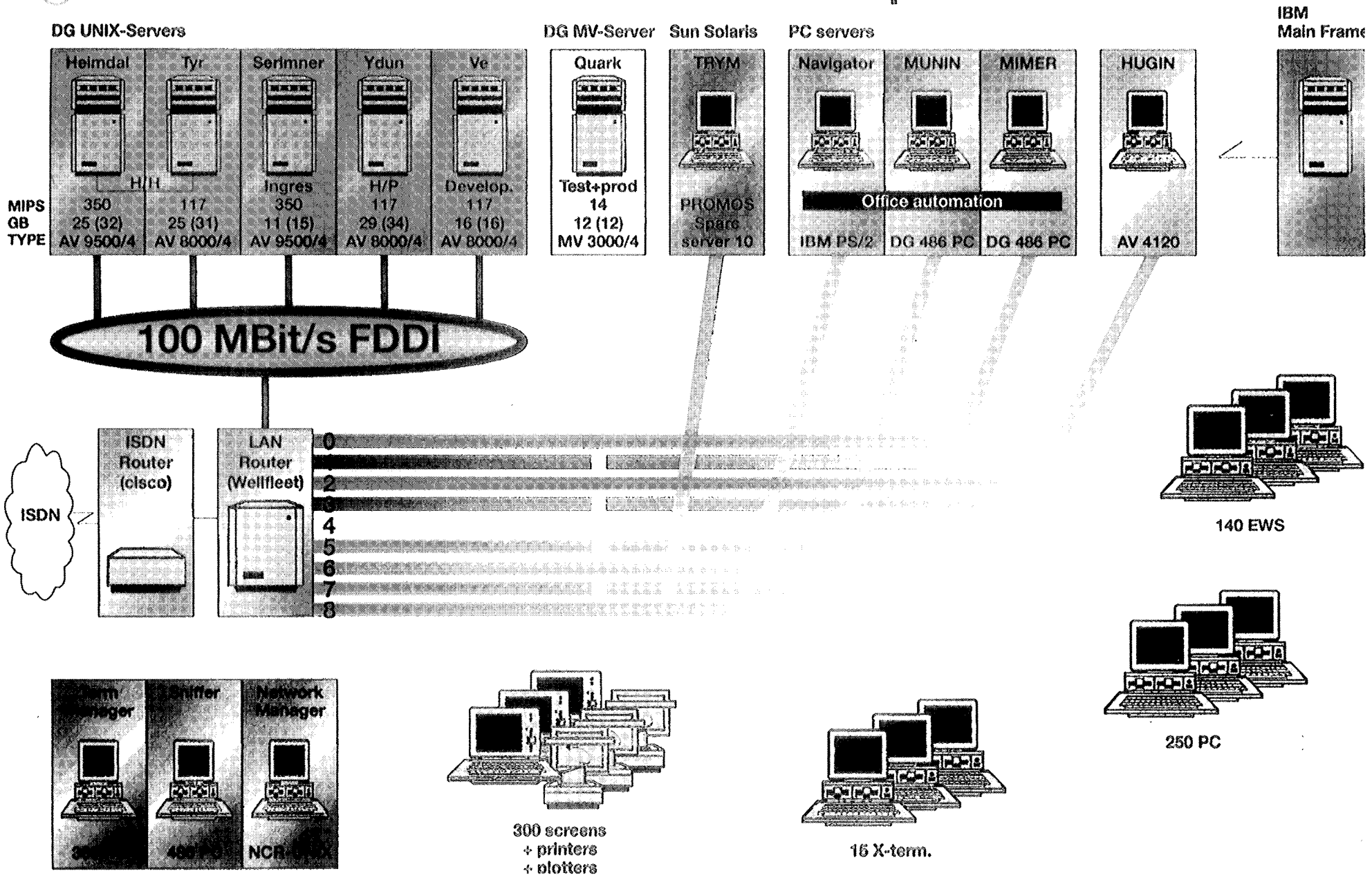
Handout Information

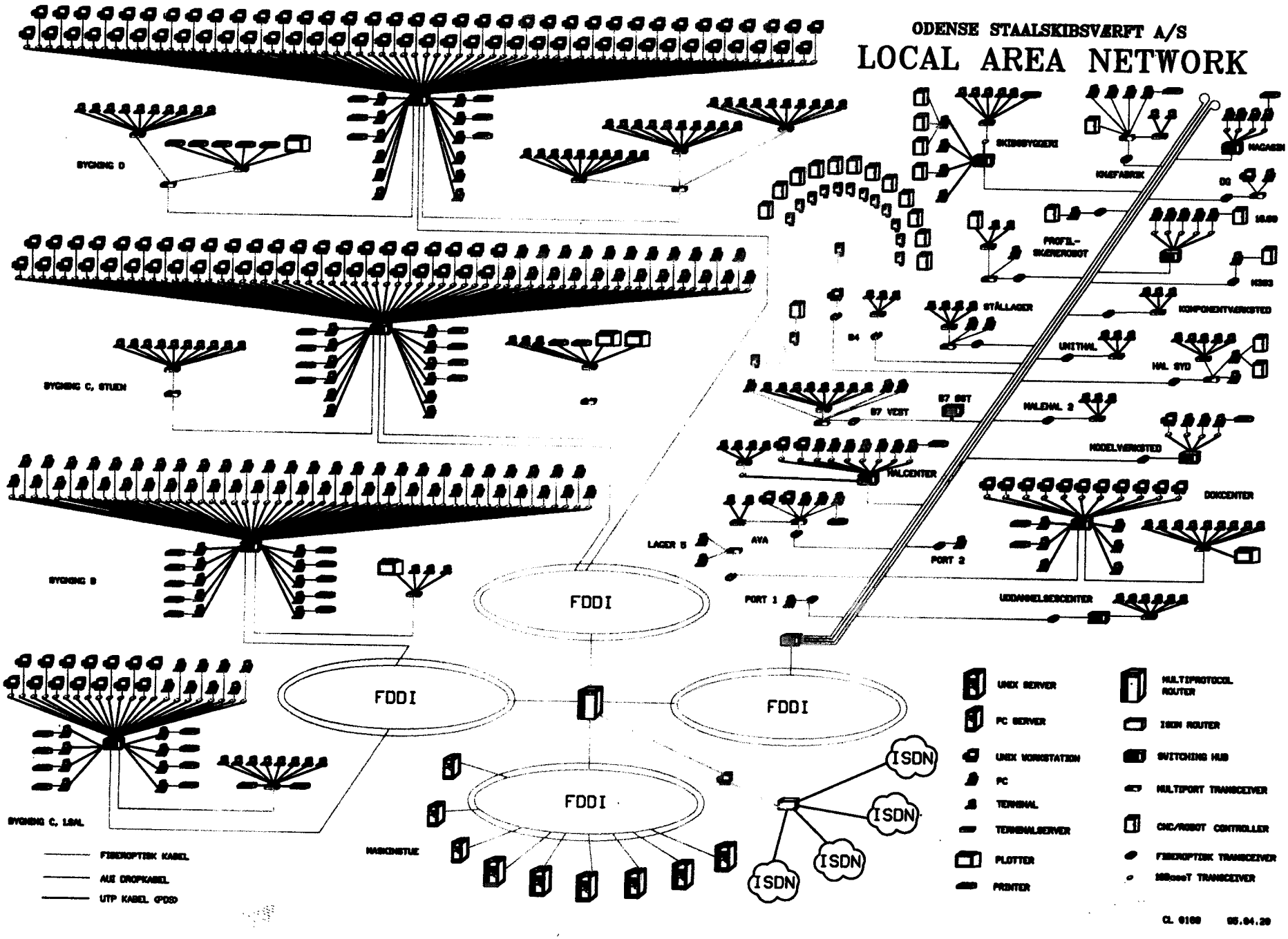
on

HICADEC/PROMOS and LAN

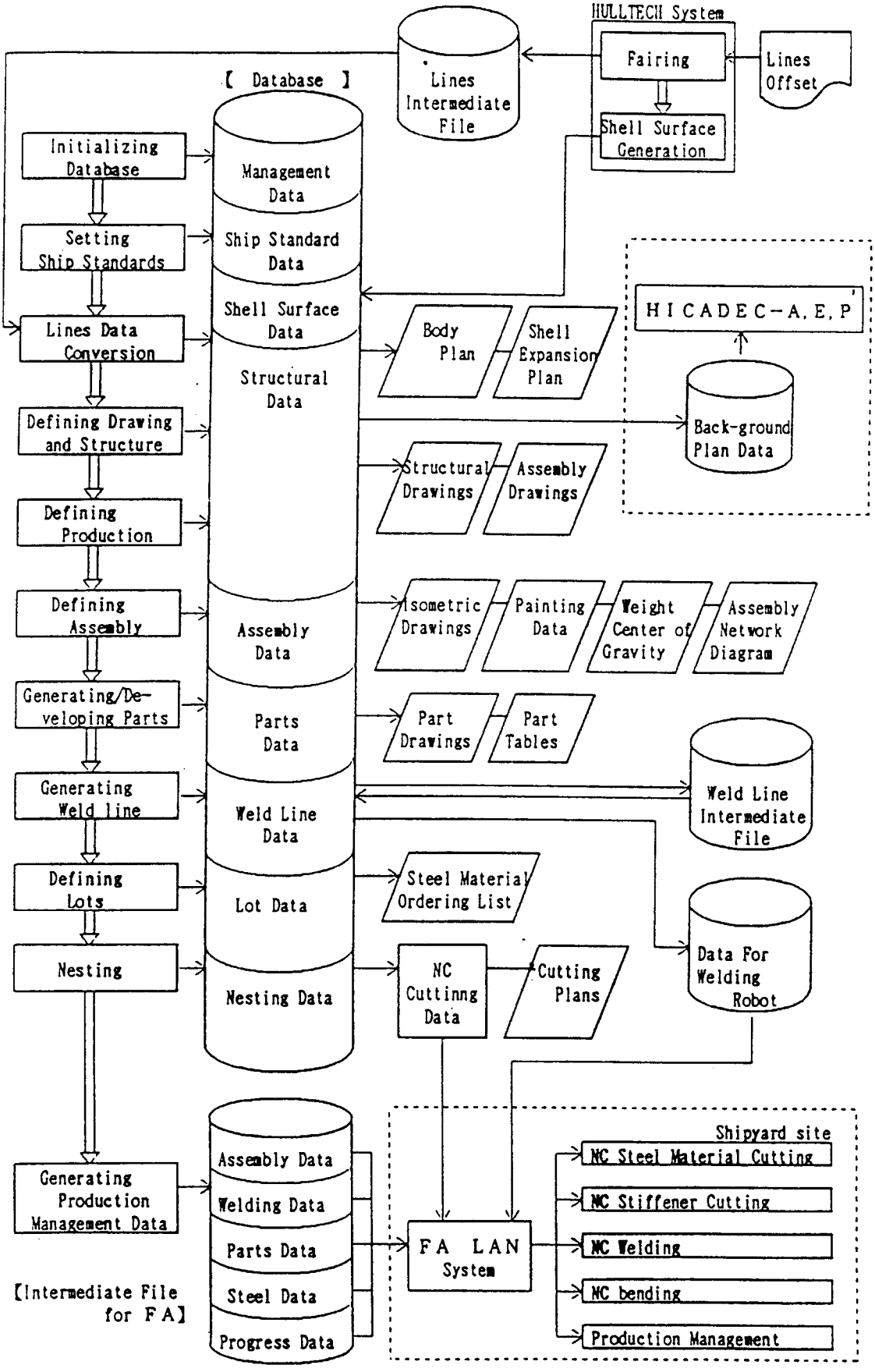
CAD/CAM

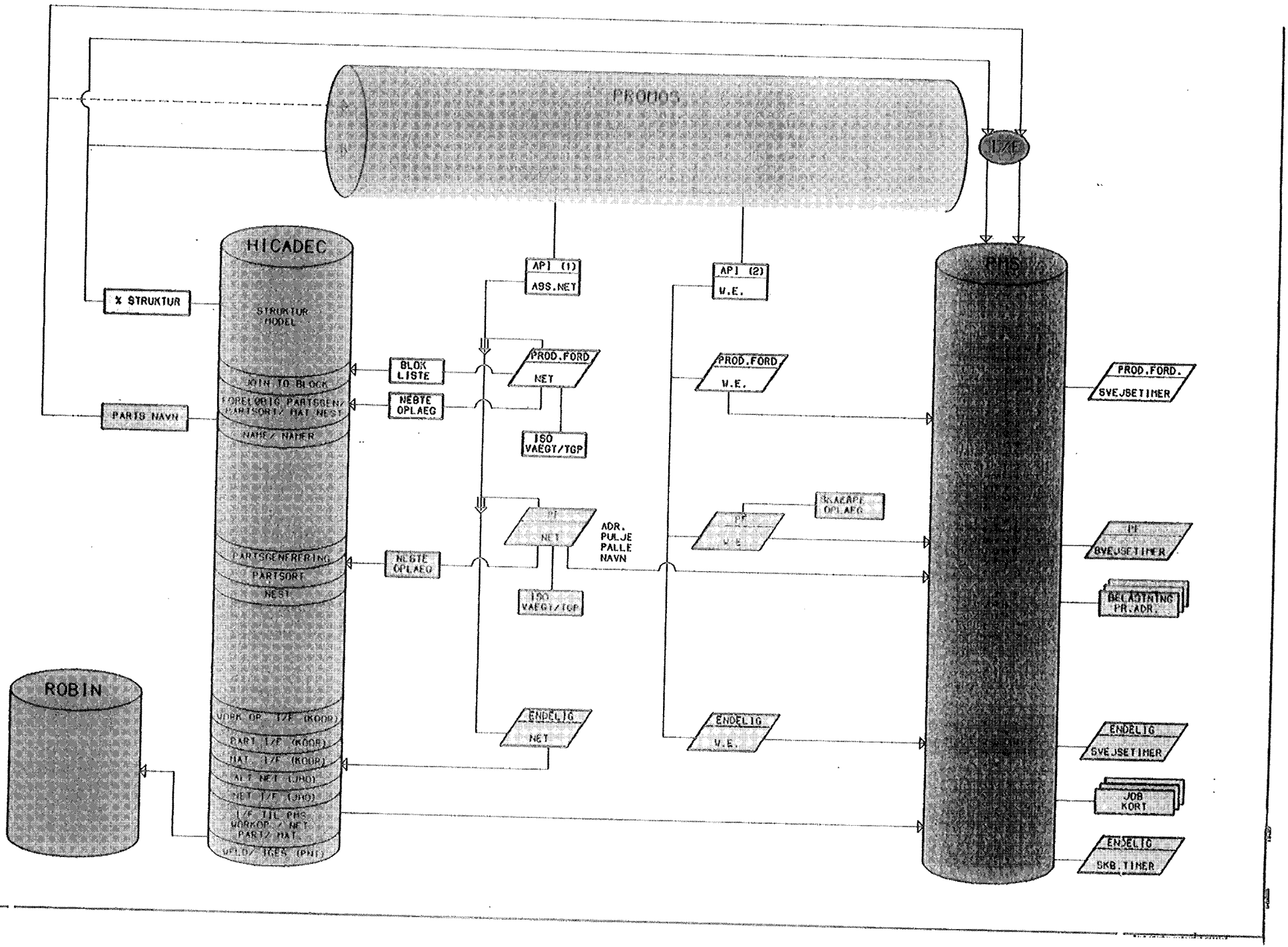
Local Hardware Set Up




ODENSE STAALSKIBSVÆRFT A/S
LOCAL AREA NETWORK
BYGNING D
BYGNING C, STUEN
BYGNING B
BYGNING C, 1.SAL
FDDI
FDDI
FDDI
FDDI
SKIBSBYGGERI
MAGASIN
KRÆFABRIK
PROFIL-SKÆREROBOT
STÅLLAGER
KOMPONENTVÆRKSTED
UNITHAL
HAL SYD
HALEHAL 2
MODELVÆRKSTED
MALCENTER
DOKCENTER
AVA
LAGER 5
PORT 2
PORT 1
UDDANNELSESCENTER
ISDN
ISDN
ISDN
ISDN
MASKINSTUE
FIBEROPTISK KABEL
AUI DROPKABEL
UTP KABEL (POS)
UNIX SERVER
PC SERVER
UNIX WORKSTATION
PC
TERMINAL
TERMINALSERVER
PLOTTER
PRINTER
MULTIPROTOCOL ROUTER
ISDN ROUTER
SWITCHING HUB
MULTIPORT TRANSCEIVER
CNC/ROBOT CONTROLLER
FIBEROPTISK TRANSCEIVER
10BaseT TRANSCEIVER
CL 6100 95.04.20

HICADEC-H SYSTEM FLOW DIAGRAM




PROMOS
I/F
HICADEC
% STRUKTUR
STRUKTUR MODEL
PARTS NAVN
BLOK LISTE
NÆSTE OPLAEG
PARTSGENERERING
PARTSORT
NÆST
ROBIN
API (1)
ASS.NET
PROD.FORD NET
ISO VÆGT/TGP
PF NET
ADR. PULJE PALLE NAVN
ENDELIG NET
API (2)
W.E.
PROD.FORD W.E.
PF W.E.
SKÆRAPE OPLÆG
ENDELIG W.E.
PHS
PROD.FORD. SVEJSETIMER
PF SVEJSETIMER
BELÆSTNING PR.ADR.
ENDELIG SVEJSETIMER
JOB KORT
ENDELIG SKÆ.TIMER

NSRP SP6 PROJECT 6-94-1

WORLD CLASS SHIPBUILDING STANDARDS

QUESTIONS AND RESPONSES FROM

ODENSE STEEL SHIPBUILDING LTD

LINDO, DENMARK

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

The following listing of Societies, Regulatory Authorities and Standards Agencies are offered to provide the reader with the agency name, country of origin and their associated abbreviations, which are addressed in this document. Refer to ASTM Standard Guide Listing - ASTM F1547-94, Relevant Standards and Publications for Commercial Shipbuilding, for a more comprehensive listing of standards.

INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS) MEMBER SOCIETIES

Lloyds Register of Shipping (Lloyds) - Great Britain
American Bureau of Shipping (ABS) - United States
Det Norske Veqitas (DVN) - Germany
Germanizer Lloyds - Germany
Bureau Veritas - France

REGULATORY AUTHORITIES

United States Coast Guard (USCG)
United states Public Health Service (USPH)
International Maritime Organization (IMO)

INTERNATIONAL STANDARDS ORGANIZATION

International Standards Organization (ISO)

NATIONAL STANDARDS

Deutsches Institute furNormung (DIN) - Germany
American National Standards Institute (ANSI)
British Standards Institute (BSI)
Japan Industry Standard (JIS)
Korea Industry Standard (KIS)

ASSOCIATION STANDARDS

Danske Vaerfters Standardiseringsudvalg (DVS) - Denmark

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A1. IDENTIFICATION OF PREDOMINANT STANDARDS	
A1.1 Is an index of Standards applications available for review?	Yes.
A1.2 What is the extent of International, Domestic & Local Shipyard Standards application?	OSS uses their own Standards publication supplemented by DVS or any others that best satisfy requirements.
A2. POPULATION STUDY OF SHIPYARD, TYPES OF COMMERCIAL VESSELS AND ENVIRONMENT EVALUATION QUESTIONS	
A2.1 What has led the shipyard to its current market segment?	AP Moeller Group Shipping Company
A2.2 What type of ships has the shipyard built over the last 25 years?	Principally container ships and tankers.
What are the annual tonnage trends?	No Response
What are the annual ship completions?	Apporximately 3-4 per year
A2.3 Do you carry out ship construction and repair?	Construction - yes. Ship repair - not as a general rule. [Presently repairing the main engine crankshaft on a Maersk containership.]
What is the repair to new construction ratio?	Negligible repair
What is the ratio of Commercial to Navy repair work?	N/A
What is the extent of modularization on new construction and repair work?	Modularization used extensively.
How is modularization applied and integrated on new construction?	No Response
What is the extent of pre-outfitting of blocks prior to erection?	90% range. ER block landed with propeller lineshaft installed.
A2.4 How many ships are currently under construction?	1 ship to be floated out of the graving dock in 3 weeks. Pre-assembly for 2nd of 12 started.
What is the schedule for current and future business?	No Response
How well are schedules met?	They are met.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
How does standardization affect construction and schedules?	Enables use of learning curves. Permits accurate construction time periods.
A2.5 What is the size and composition of the current labor force?	
What are the average annual total personnel numbers?	2800
Hourly	2400
Salaried	400
sub contracted	200
How has the level and composition of personnel changed over the last 10 years?	Down from 7000+ in the mid 1980's
What has influenced composition of personnel the most?	Work backlog, technology and automation.
What are the general experience levels of personnel at the yard?	No Response
What is the average employment years of personnel at the yard?	No Response
Hourly	No Response
Salaried	No Response
Subcontracted	No Response
How has the experience level of personnel changed over the last 10 years?	No Response
A2.6 What do you believe is the market position for the worldwide shipbuilding industry?	No Response

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A2.7 Who are this shipyards major competitors	Japan 42%, Europe 24%, S. Korea 16%, Others 18%
What is your share of the market segment?	2.8% of world market
What are the current market risk areas?	No Response
What are the economic effects?	No Response
A3. SHIPYARD / CLASS SOCIETY STANDARDS AND POPULATION STUDY These questions explore the standards bases that are available and used in preference by the Shipyard and Classification Societies.	
A3.1 With your current customer base, which Class Societies are you presently working with?	Principally Lloyds and others where required.
What is your Class Society of choice?	No specific choice. Decided by owner. Have used Lloyds, ABS and DNV.
To what extent do you use ISO standards?	Utilized to extent OSS had a need. Used any number of sources and added yard specific information to suit OSS.
To what extent do you augment Class Society requirements with yard standards (basic proportion only)?	Where needs or practicality dictates. Example, OSS adds ~ 5mm to lineshaft diameter in way of bearings for re-machining over life of vessel. Generally no interest in driving costs higher.
How do you accommodate different customers' needs with respect to Class Societies and Standards applications?	As required by the customer. Changes in material requirements would require a new parameter HICADEC input to allow proper material/component selection from CAD data base.
Do you use a Master set of standards and make minor alterations as necessary?	Yes, deviations to suit customer (at a cost unless in original contract).
Are standards sets based on specific, and limited range of, Customers/Class Societies?	Customer driven.
How are standards and standardization presented to the customer?	Standards used are given to the customer for his signature acknowledgment as part of the contract.
How are standards and standardization incorporated in Ship Specifications?	By a statement in the contract that invokes OSS standards or by specific wording in the contract that describes the standard(s) in full.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A3.2 How do you access other Class Societies standards?	OSS has a full set of JIS and DVS standards. They have catalogues only for other standards such as DIN, BIS, etc. The latest revisions for all are available at Denmark's University, on an as need basis.
What is the extent and scope of the Shipyard library?	See A3.2 above.
What is the format of Shipyard Standards?	Refer to attachment (1) for examples of OSS standards.
Does a Shipyard Standards Manual exist and what does it contain?	OSS has developed about 580 standards and compiled them in 9 volumes. They are distributed in full to 40-50 areas in the shipyard.
A3.3 Does the Shipyard library have a standards equivalency cross reference system.	Yes. They have the Japan Maritime Standards Association report that cross references Class Society Standards. OSS would like ISO to adopt and publish this report. Some OSS standards have a reference for its standard of origin - as applicable.
A3.4 To what extent are specific equipment's and other standards pre-approved for use?	Vendors initiate action as necessary.
Are these standards pre-approved?	To some extent , yes - where required and previously approved by Class Societies.
By Regulatory Authorities?	Did not have but believed not a problem.
By Class Societies?	Yes
Are standards contract specific?	In some cases. Driven by the Customer and Class Society specified in the contract.
A3.5 How do you negotiate requirements with the Customer?	Standards are provided for evaluation stage. Detail discussions - Customer to OSS - will be with the technical department responsible (technician level) will follow.
Who negotiates the standard?	See A3.5 above.
Contracts Group?	Produces/collects input from disciplines develop and finalize formal contract.
How does the Standards Group integrate with the negotiation process?	As required, but not as a rule.
A4. ORGANIZATION AND BENEFITS The following questions concern the existence of the standards group and are based on a review of the shipyard organization.	
A4.1 Why is the standards group positioned in the organization the way it is?	To enable serving needs across all disciplines and to provide a central control for the formalizing and distribution of standards.
Who does the Standards Group report to?	VP of Engineering

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SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
Who reports to the Standards Group?	All disciplines - each having responsibility for their own standards. Each discipline has a designated person responsible for standards.
Who are the Standards Group primary customers?	Technical disciplines.
A4.2 When was the Standards Group formed and why.	Formed in 1986 to provide uniform application of standards format and to provide for uniform and controlled distribution of standards information throughout the shipyard.
How did the Standards Group develop and what is the group's history?	Group was much larger - 9 people. currently 2 people.
Where is the Standards Group physically located?	Within the Engineering complex.
What is the charter of the Standards Group?	To coordinate the formal standard for issue upon receipt of the approved standard from Engineering; maintain a central file; provide latest information/issues of issued Class Society standards.
What is the short and long term goal of the Standards Group?	Implementation of the DVS as the only standard for OSS. (DVS is used to some extent by all of Denmark's 10 shipyards and exists as the only standard for 2 of these shipyards.)
A4.3 What are the internal responsibilities of the Standards Group?	Individual disciplines are responsible to negotiate approval of standards as required with Class Societies (usually starting with Lloyds). The Standards Group is responsible to control formal documentation, finalize format and issue.
A4.4 What is the external awareness of the Standards Group to the world class standards?	Very high
Meeting standards?	OSS does a good job at meeting standards. Standards are an integral part of their quality program.
Maintaining standards?	The maintenance of standards is done by the cognizant technical division on an as required basis - "as required" can be identified by anyone.
Developing standards?	New standards are developed by adopting and/or modifying existing standards or by creating a totally new standard with input from all users.
What is the Standards Group accessibility to National and International standards?	The Denmark University maintains current revisions of Class Society and national or association standards and they are readily available upon request.
A4.5 What is the structure of the Standards Group?	
What are the personnel capabilities, skills and educational levels?	Very experienced senior people with desire to work on standards and has the breadth and depth to review with all production affected areas.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
What is the cycle of personnel to and from the Standards Group?	Not rotated by any plan - maybe upon request.
What are the specializations of the Standards Group personnel?	Refer A4.3 response.
What is the supervisory level required for the Standards Group?	No Response
What supplementary training is offered/required for the Standards Group?	None. Need to start as a skilled person in area assigned.
What facilities are available to the Standards Group to expedite standards work (e.g., PC, Network system)?	PC's for word processing only. Most all standards are resident in their respective technical departments CAD data base.
A4.6 How are shipyard standards developed?	
What is the standards development process?	Specific disciplines within Engineering develop their own standards and process through the required approval process, starting with Lloyds, and then submit the approved standard to the Standards Group for formal issue and filing.
How are the standards requirements evaluated?	By the originator, by purchasing and by Class Society. (MM Moller has approval option for all standards.
What is the approval process for stds?	See above.
How is shipyard feedback on standards requirements achieved?	New requirements are identified by Engineering or Production.
How is vendor feedback on standards requirements achieved?	Very rare for general purchase items - does occur for performance standards as necessary.
A4.7 How is the Standards Group perceived in the shipyard?	Well accepted because of experience and knowledge.
By upper management?	Important all the way to the Chairman, Mr MM Moller. Ensures consistent quality. Provides basis for negotiations with the customer. Provides for work proficiency.
By internal and external customers	same as above
What is the qualitative value of the Standards Group?	High.

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A.5 STANDARDS DATA BASES	
A5.1 Are Class Society requirements and standards held in a data base?	No, as to the final formal standard. Yes as to individual standards technical content, which are held in the technical disciplines CAD data base.
A5.2 What is the size and type of the data base?	Approximately 580 (see above A5.1)
A5.3 How is the data maintained and updated.	On an as needed basis by the cognizant technical department.
A5.4 Are National and International Standards held in the data base?	No
A6. PAPER BASED STANDARDS CONFIGURATION	
A6.1 What is the mechanism for distribution?	As a paper product from the Standards Group to 40-50 Standards volumes located throughout the shipyard. "Owners" of these Standards volumes are responsible to incorporate new/updated revisions into their own volumes.
A6.2 What is the format of Standards and how are they processed?	Format shown in Attachment (1). Processed by numerous methods - manually, CAD and word processors - by the discipline and Standards Group personnel.
A6.3 How are the standards tied to other engineering or production documents?	
Engineering Drawings?	Integrated into the drawings - by reference entry into the CAD model or by direct insertion onto a production drawing
Ship Specifications?	Specified in the Contract.
Production Plans?	Same as Engineering Drawings.
Check lists?	Standard checks are referenced in the Engineering check lists.
A7. CAD BASED STANDARDS CONFIGURATION	
A7.1 What is the architecture of standards in cad?	Entered into HICADEC for both Structure and Outfit - is rule based, built in module.
A7.2 How are standards integrated with CAD based Engineering?	
Catalog data base	In HICADEC P
Catalog data base with vendor input and format?	no

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
Interface between Engineering CAD and standards data base?	General material requirements and dimensions for items such as valves and flanges are incorporated into the data base.
A7.3 How are standards presented to the CAD operator?	
By default?	By default after initial selection.
By selection from accessible data base?	yes
By decision tree?	A decision tree is integrated into HICADEC with technical over-ride where applicable. [OSS purchased a well integrated system and then significantly enhanced it to suit OSS requirements.]
A7.4 How is the engineering bill of material used downstream?	
Material requirements planing (MRP or MAC-PAC)?	yes
Network system?	yes
Manual system?	no
A7.5 How are standards distributed to Computer Aided Manufacturing?	electronically
A7.6 What standards are best incorporated into CAD/CAM?	Manufacturing standards and details (non-performance based)
What are the priorities?	timely
Are those standards stable or dynamic?	stable
Are the standards restrictive?	not restrictive

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B1. ORGANIZATION IDENTIFICATION	
B1.1 What is the approximate ratio of computers to engineers?	High, 1:1, in the cognizant technical sections - approximately 12 people. None in the Standards Group - 2 people.
B1.2 Are there any subsidiary yards in the company?	Yes, OSS recently acquired a shipyard in Estonia, to build hatch covers. ~ 500 people
B1.3 What is the level of Engineering done in house vs subcontraacted?	All Engineering is done in house. [Equipment having performance based standards have engineering done by the vendor, but final review and approval rests with OSS.]
B1.4 What types of engineering are typically subcontracted?	Performance based standards and or contract specified components.
B1.5 What is the awareness/familiarity of contract level designers/engineers in standards details?	High. Integrated in the HICADEC system with utilization triggered by programmed questions.
B1.6 What is awareness/familiarity of production personnel in standards details?	Very high. Production personnel have access to local work stations and often are persons reassigned from Engineering to Production following design completion and at start construction. These same people often return to Engineering to resolve design problems as they become visible in the production cycle.
B1.7 How are make/buy decisions made? Why might they be changed? How are they changed?	Most parts made in house. Engineering evaluations are made, working with Purchasing, for cost effectiveness. May subcontract out to local specialized firms.
B2. STANDARDS INTEGRATION	
B2.1 How are ship specifications categorized/indexed? Are Ship Work Breakdown Schedules (SWBS) used?	OSS Standard (not DVS) 450 page spec. May be modified per customer request.
B2.2 How are system design requirements provided to engineers?	CAD. Build strategy programmed into CAD system.
B2.3 Who is responsible for selection of standards on each contract?	Varies with the standard. Engineer/designer selects hanger type; Dept Head selects material schedule.
B2.4 How are restrictions on use of standards identified?	All standards used are specified in the Production dwgs.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B2.5 What type of Manufacturing Resource Planning (MRP) proacess do you use? This process identifies when quantities of each type of itemrequired to build the ship is required in the shipyard.	Integrated into the Hicadec system schedule (structural and outfit CAD HICADEC/PROMOS.)
B2.6 How do engineers find standards?	CAD and 9 volumes of OSS standards plus utilization of other standards where OSS standards do not satisfy customer needs.
B2.7 How do engineers/designers identify the components they want to use from the standards on their drawings?	Part numbers on standards are identified/input in model.
B2.8 How many contract unique standards does the shipyard have?	Very limited.
B2.9 How are changes to the standards handled?	By cognizant department.
B2.10 How are standards imposed on sub-contractors?	Provided to them in OSS purchase order.
B2.11 How are planning issues handled for standard vs. non-standard parts?	No difference.
B2.12 How are non-standard items identified to replace standard ones?	As needed.
B2.13 How is non-conforming material handled? What amount of non-conforming material is delivered to the yard? How is this prevented?	Limited equipment received. Not an issue
B2.14 What is the level of detail in a composite drawing? How does it identify system components? How does the composite compare to the diagram?	Minimal - On a need to know basis.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B2.15 How well integrated are standard vendors (CAD, purchase specifications, vendor furnished information)?	Limited number of vendors. Contact through fax to get missing information.
B3. INTERNAL APPROVAL PROCESSES FOR STANDARDS APPLICATIONS:	
B3.1 Is there a formal process for maintenance of standards?	Individual departments responsible. Must be signed off by purchasing and cog dept.
B4. PREDOMINANT STANDARDS USED BY REGULATORY AND CLASSIFICATION BODIES:	
B4.1 How do our definitions of standard types compare with yours?	Not much difference
B4.2 Do you have other types of standards that you regularly use?	Quality standards and work processes.
B4.3 Do you have standard vendors? If so, who are they?	Yes, manufacturers listed in ship specifications.
B5. REGULATORY AUTHORITY AND CLASSIFICATION BODY APPROVAL PROCESSES:	
B5.1 Which regulatory/classification bodies require approval of the standards?	Lloyds
B5.2 How is regulatory/classification body approval of standards handled?	Responsibility of cognizant department to obtain final approval from Classification society of specification.
B5.3 Which standards must be approved by these bodies?	Identified on standards and also identified by regulatory bodies and class societies integral with their published documents.
B5.4 How do you view ISO 9000 certification?	Do not intend to get certified but do use philosophy as much as practicable.
B6. USE OF SHIPYARD VERSUS STANDARDS ORGANIZATION STANDARDS:	
B6.1 What are most of the shipyard standards based on? ...JIS, ISO?	DVS, DIN
B6.2 How do the shipyard standards compare to other national or international standards?	Very similar, when new standards are needed, OSS will utilize existing standards whenever possible.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B7. FORMAT OF SHIPYARD STANDARDS:	
B7.1 What are the perceived benefits of standards?	Process gets commitment.
B7.2 How are preferred standards identified?	Not identified.
B7.3 How do you identify the following requirements in your standards?	
Engineering selection criteria?	Rely on engineering experience.
Identification on engineering products	Part Numbers
Fabrication information for suppliers?	Copy of standard provided through purchasing.
Fabrication test requirements?	QC handles all testing. Not part of standards.
Installation information for production personnel?	Shown on production fab or installation drawings.
Installation test requirements?	Shop process.
B8.2 What are some recent changes in your standards program?	None significant. Working through DVS tolerances of steelwork plate specs and surface protection.
B8. EXAMPLES OF TYPICAL SHIPYARD STANDARDS:	
B8.1 What are your standards for the following applications?	
Pipe hangers	U bolts built by vendor
Ladders	See Attachment 1
Wireways	See Attachment 1
B8.2 Are these parts built by the yard or by sub-contractors?	Built by yard
B8.3 Are subcontractor's parts specified or does subcontractor build to shipyard requirements?	Both
B8.4 What primary factors influence these designs?	
Internal shipyard processes?	Primarily

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
National/International Organizations?	May use
Classification Societies?	Where required

ATTACHMENT (1)

- **Examples of Odense Steel ShipyardStandards**

Gælder fra ny serie ovgn. 113.

1. Generelt

1.1 Alle rørbæringer skal opsættes i henhold til OS 0501 og 0502 eller efter tegnestuernes tegninger.

1.2 Store rørbæringer, som påsvejses styrkekonstruktioner, skal godkendes af ståltegnestuen. Rør fra dn 150, ø D 168.3, og større.

2. Anvisning for udførelse og opsætning af rørbæringer

2.1 Almindelige regler :

- det bør altid tilstræbes, at rørene lægges på en sådan måde, at rørbæringerne bliver så korte som muligt.
- rørbæringer anbringes altid på stag, bjælker og andre forstærkninger (kraveller eller lign.), hvor dette ikke kan lade sig gøre, anbringes for rør over dn 50, ø D 60.3 doblingsplader.
- rørbæringer anbringes altid min. 50 mm fra svejsesømme.
- skal rørbæringer påsvejses på faceplade, må den kun anbringes midtover kropplade, max. afvigelse 25 mm til hver side (se skitse side 8).

2.2 Rundstålbøjler OS 3176 og (OS 3521).

2.3 Rørholder OS 3188 til rørbøjler OS 3176.

2.4 Pladerørholder OS 3104.

2.5 Ekspansionsstop OS 3107.

2.6 Doblingsplader se OS 0703. Rørbæringer for rør mindre eller lig med dn 50, ø D 60.3 kan opsættes uden doblinger. På olietæt skot samt webspant opsættes altid doblingsplader.

2.7 Retningslinier for påsvejsning af mindre konstruktionselementer se OS 0702.

3. Montering af rørbøjler

3.1 Frigående rørbøjler se fig. 1

3.2 Fastspænding se fig. 2, (4) og (5).

4. Afstand mellem rørbøjler og rørbæringer

4.1 Afstand mellem rørbøjler og rørbæringer se OS 0502 side 1-3.

4.2 Mindre rør (manometerrør osv.) kan fastspændes til større rør, se fig. 3 side 2

Iøvrigt se montageeksempler side 4-9. Grænse for rørstørrelse i viste eks. er dn 300, ø D 323.9
For større rør tegnes og bestilles rørbæringer af tegnestuen.

For ophæng uden bøjler se side 10-11, max. dn 150, ø D 168.3.
Note : For lagerføring af standard og materiale se gældende EDB-lagerliste.

Anvendes for rør dn 15 - 1000, udv. ø D 21.3 - 1016 (stål- og metalrør).

Skitse for rundstålbøjle

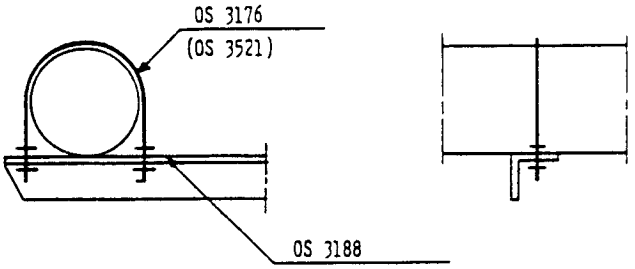


FIG. 1

Fastspændt rør

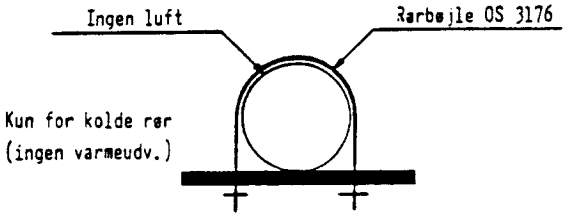


FIG. 2

Skitse for rundstålbøjle

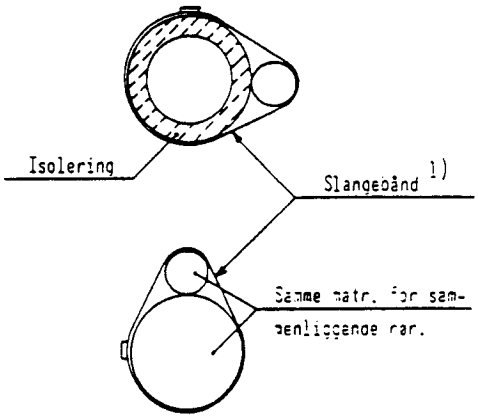


FIG. 3

Anvendes for rør mindre ell. lig med dn 8, ø D 13.5.

1) På åbent dæk eller i fugtige rum må der kun anvendes rustfrie slangebånd.

FIG. 4

Anvendes for rør mindre eller lig med dn 15, ø D 21.3, max. 9 rør sammen.

OBS.: Må kun anvendes til manometerrør og lign. af blødt kobber. For stive rør, f.eks. hydraulikrør af yorcalbro og lign. må der anvendes andre rørophængningsformer, se rørholder for hydraulikrør OS 3131.

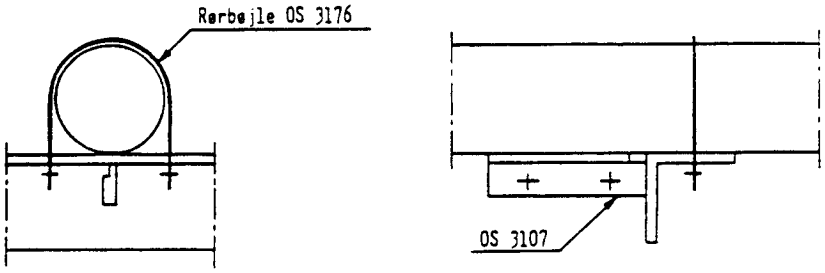


FIG. 5

Fastspændt rør med ekspansionsstop

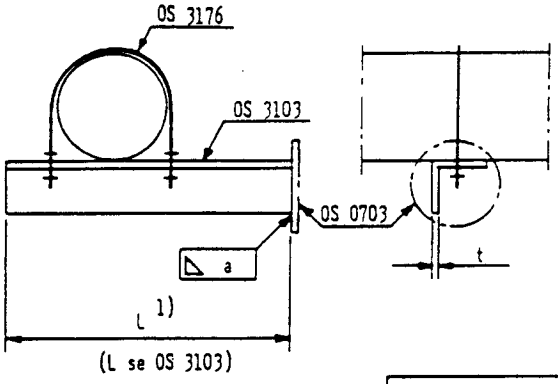


FIG. 6

Rørtykkelse t	Svejsning a
5	3
7	3.5
8-10	4.5

Doblingsplade OS 0703			Anvendes til
Diam.	tykk.	Færd. varenr.	⌊ stål osv.
80	8	008051	30 x 30 og 40 x 40
110	10	008064	50 x 50 og 65 x 65
160	12.5	008077	100 x 65
220	14	008080	150 x 75

1) L max. 500 mm. Hvis L er større end 600 mm anvendes fig. 7.

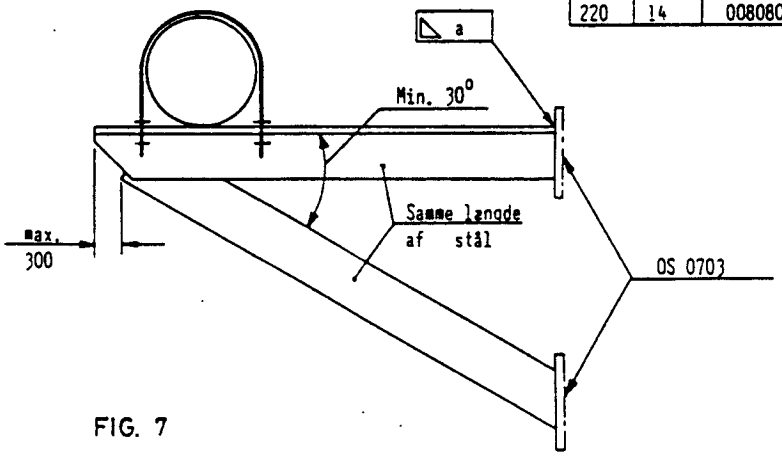


FIG. 7

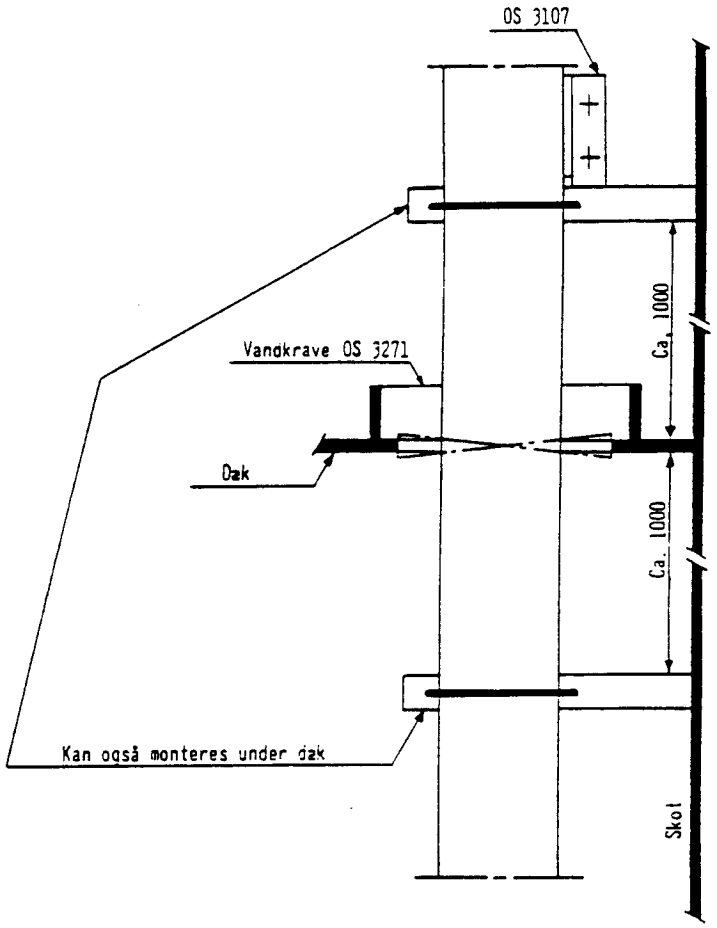

OS 3107
Vandkrave OS 3271
Dæk
Kan også monteres under dæk
Ca. 1000
Ca. 1000
Skot

FIG. 8

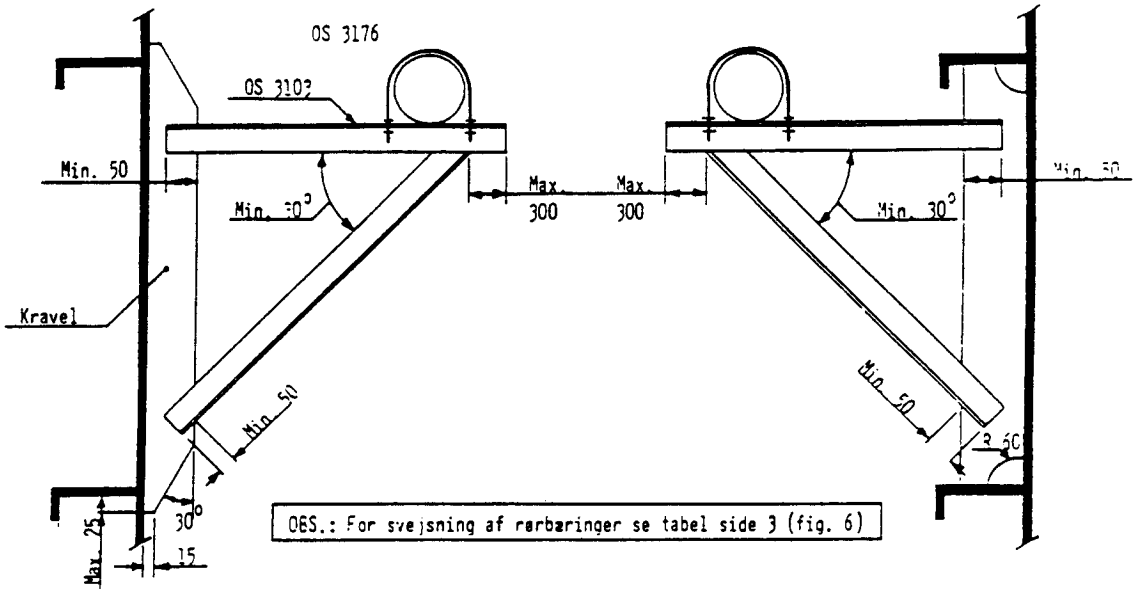


FIG. 9

FIG. 10

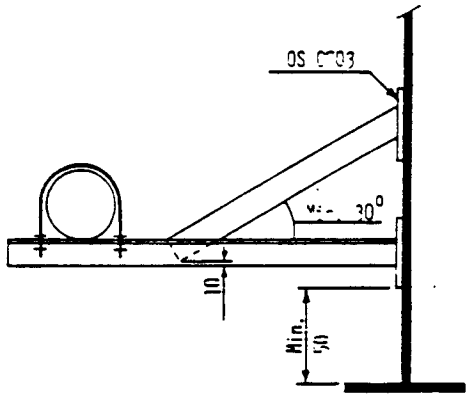


FIG. 11

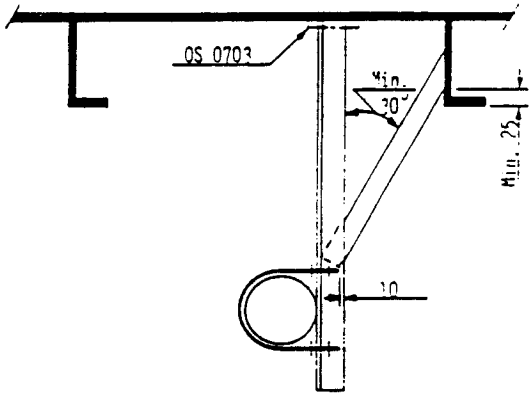


FIG. 12

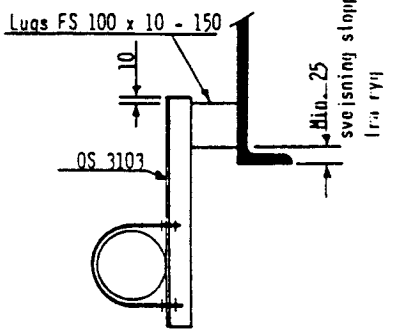


FIG. 13

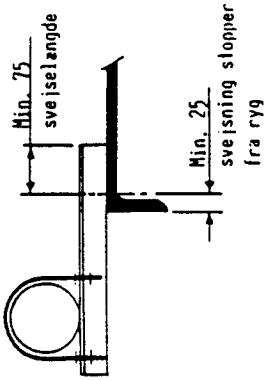


FIG 14

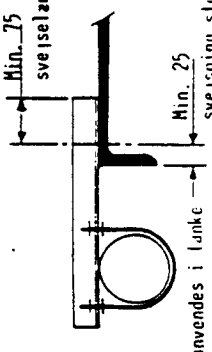


FIG. 15

NB ikke anvendes i lukke
samt på åbent dæk.

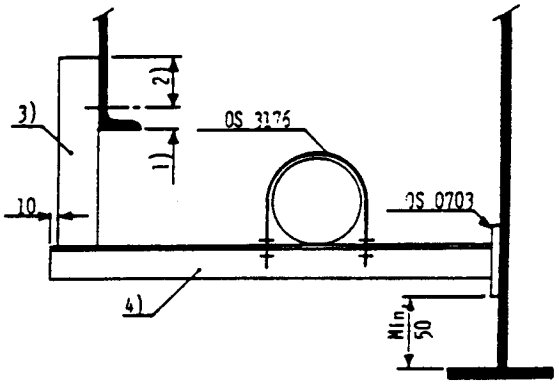


FIG. 16

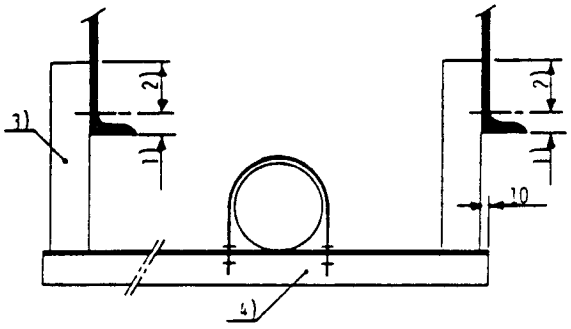


FIG. 17

GENERELT FOR FIG. 16 - 19

1) Svejsning stopper min. 25 mm fra ryg.

2) Min. 75 mm svejselængde.

3) Ved kort ophæng, min dim. FS 75 x 12.

4) Min. 75 x t*

* t = min. 9 mm i tanke og andre steder, hvor der er fare for kraftig tæring.

5) Min. 50.

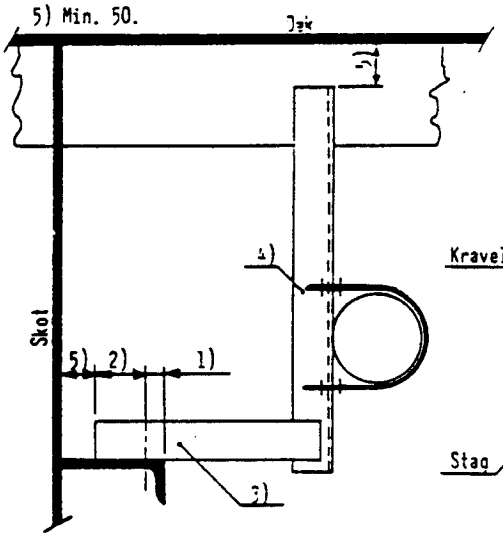


FIG. 18

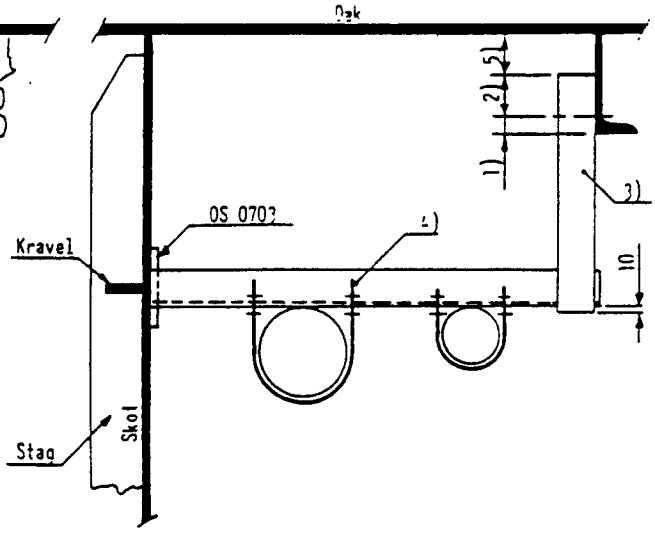
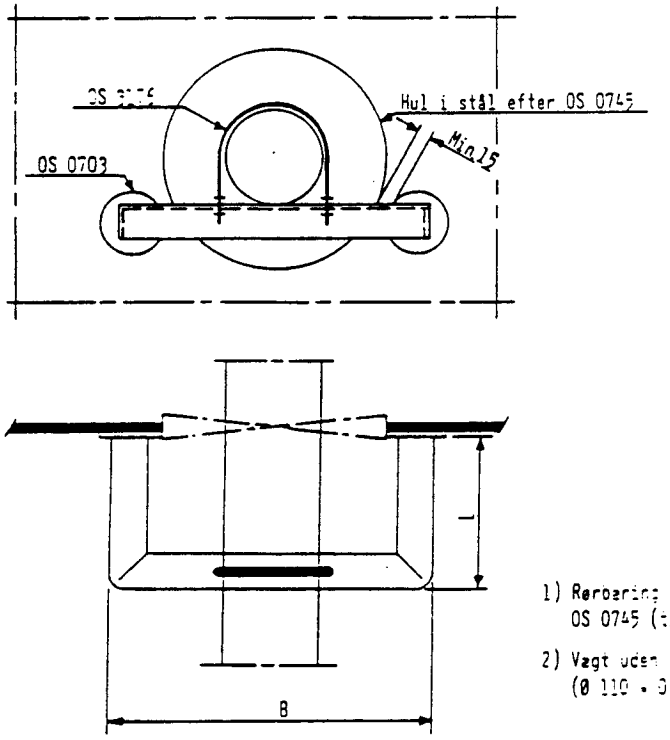


FIG. 19



1) Rørbøjning udført efter hul i stål OS 0745 (til og med NT 100)

2) Vægt uden doblingsplader.
(Ø 110 • 0.75 kg, Ø 160 • 1.97 kg)

FIG. 20

Rør dn	Rør udv. diam.	Rørbøjning [1] B	H	udfol. længde	dim.	matr.v.nr.	vægt kg	Doblingsplade OS 0703 stk. D	stk. v.nr.
10 - 20	17.2 - 25.3	210	180	550	30 x 30 x 5	020275	1.20		
20 - 32	33.7 - 42.4	260	230	620	40 x 40 x 5	020291	1.84		
32 - 50	48.3 - 60.3	320	290	700	50 x 50 x 5	020303	2.64		
65 - 100	76.1 -114.3	420	390	822	60 x 60 x 8	020329	5.32	110	008064
125 - 150	139.7 -168.3	520	490	940	65 x 65 x 9	020358	8.10	110	008064
200 - 250	219.1 -273	700	660	1142	75 x 75 x 8	020374	10.0	160	008077
300 - 450	323.9 -457.2	900	850	1378	100 x100 x10	020415	21.0	160	008077

OBS.: For svejsning af rørbøjninger se tabel side 3 (fig. 5)

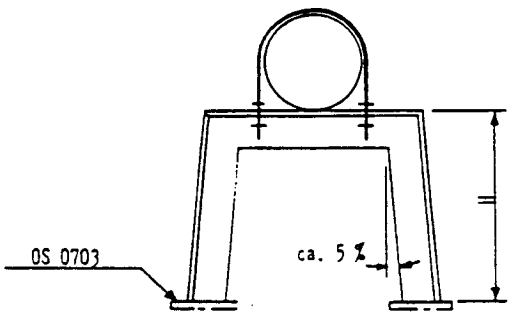


FIG. 21

Buk for enkelt rør (dn 150 - 400, Ø D 168.3 - 406.4). Hvis H er større end 2 x rørets udv. dia. tegnes og bestilles den af tegne-

ANVENDELSE: I TANKE.

Al svejsning min.
5.0

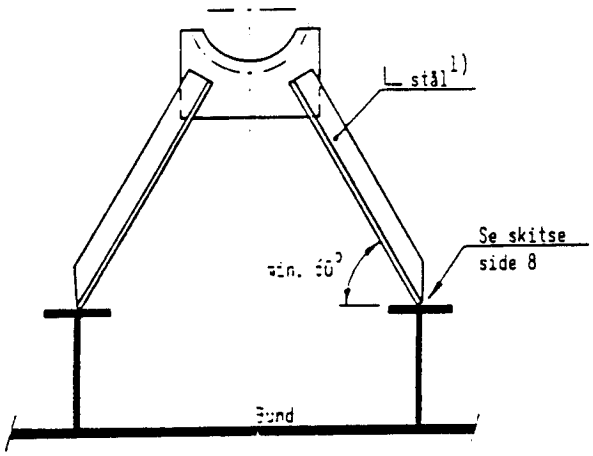


FIG. 25

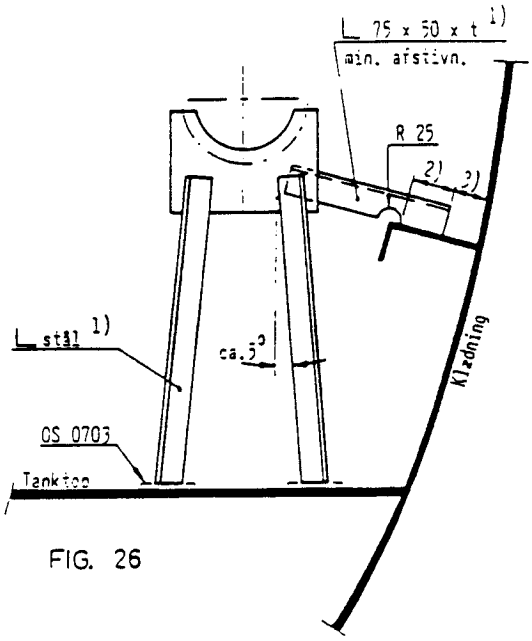


FIG. 26

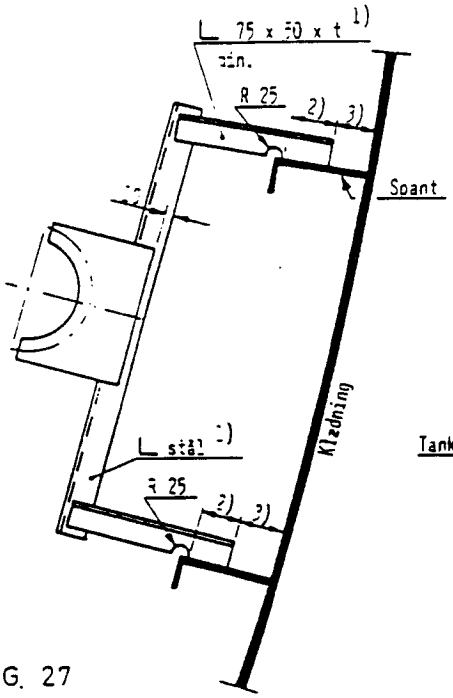


FIG. 27

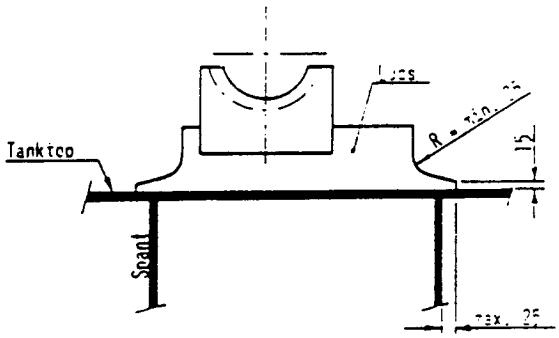


FIG. 28

1) t = min. 5 mm i tanke og andre steder, hvor der er fare for kraftig tæring.

2) Min. 75.

3) Min. 50.

ANVENDELSE: AFLØBSRØR , KABELRØR , LUFT - OG PEJLRØR OSV.

Max. dimension dn 150, ø D 168.3.
(Sorte rør med muffesamlinger).

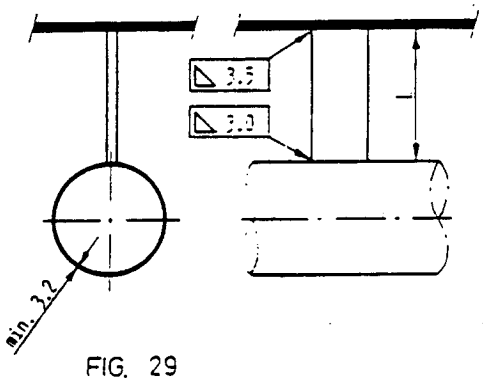


FIG. 29

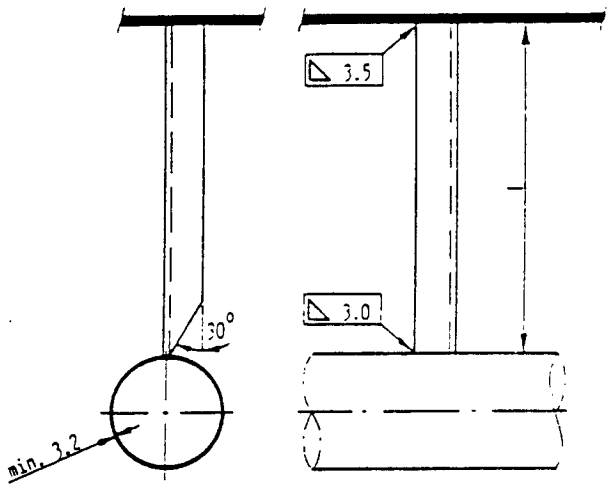


FIG. 30

Ophæng		
Dim.	L max.	matr. varenr.
FS 30 x 6	70	022237
FS 50 x 8	180	022448
L 30 x 30 x 5	350	020275
L 50 x 50 x 5	1000	020303

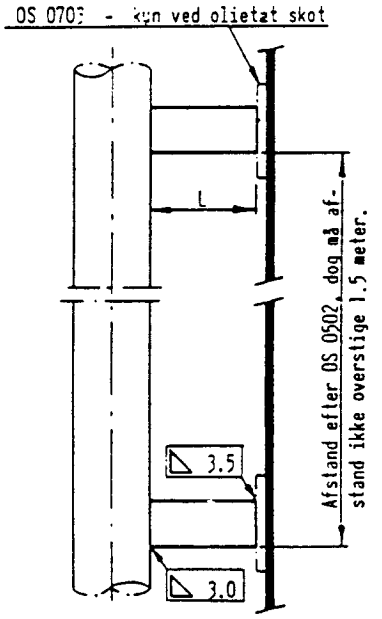


FIG. 31

ANVENDELSE: AFLØBSRØR , KABELRØR , LUFT - OG PEJLRØR OSV.

Max. dimension dn 150, ø D 168.3.
(For rør, som bliver varmforzinket, flangesamling)

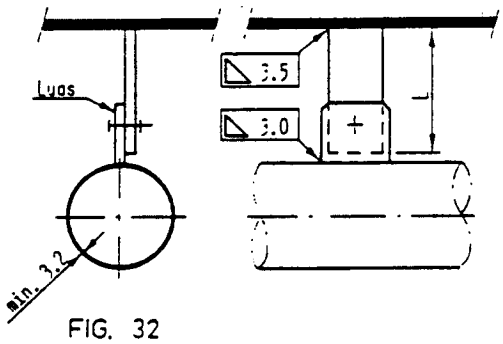


FIG. 32

Ophæng		
Dim.	L max.	matr. varenr.
FS 30 x 6	70	022237
FS 50 x 8	160	022448
L 30 x 30 x 5	350	020275
L 50 x 50 x 5	1000	020303

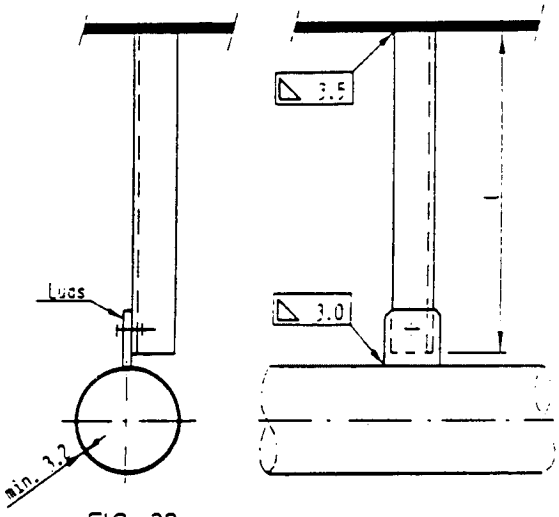


FIG. 33

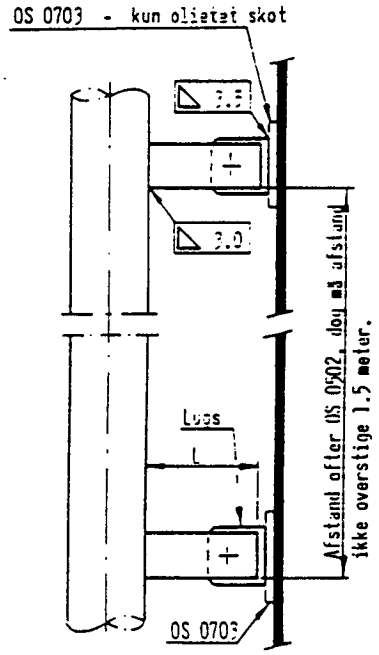
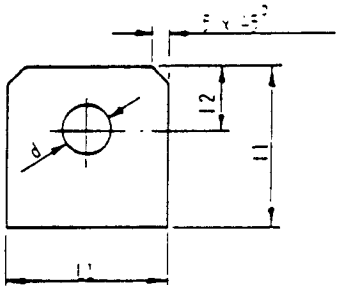


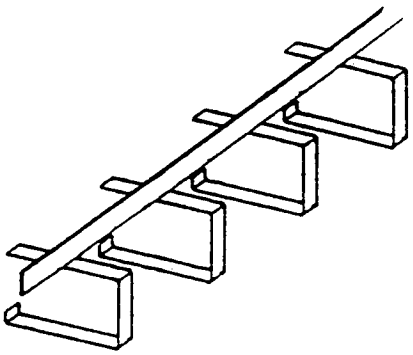
FIG. 34

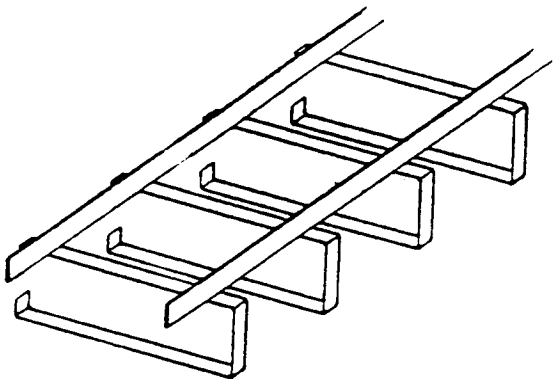


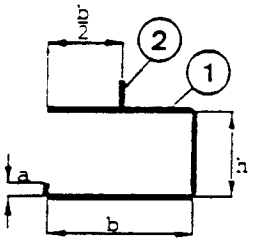
Rør		Lugs				
dn	Udv. diam.	l1	l2	d	Dimension	matr. varenr.
10 - 50	17.2 - 60.3	40	15	11	FS 40 x 5 x 11	022207
65 - 150	76.1 - 168.3	50	20	16	FS 50 x 8 x 11	022448

Satskrue		Fjederskive		Møtrik	
Dim.	varenr.	Dim.	varenr.	Dim.	varenr.
M8 x 25	216015	8.2/14.9/1.6	224147	M8	220906
M12 x 30	216038	12.2/21.1/2.1	224156	M12	220912

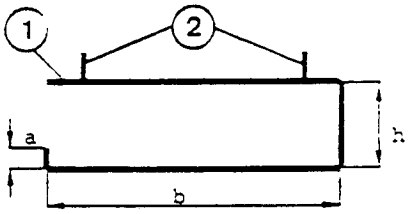
Reference til : DVS 71002. Kabelbærer fremstilles efter DVS tegning ucer :en.







TYPE 1B og 2



TYPE 3B og 4

Størrelse (b x h)	Standardiseret som DVS type	b	h	a	Vægt kg/stk.
100 x 50*	1B	110	50	20	3.40
150 x 50		150			4.10
210 x 50		210			4.50
410 x 50	3B	410			8.50
310 x 80	4	310	80	30	7.90
410 x 80		410			8.90
110 x 110*	2	110	110		3.90
210 x 110		210			5.00
310 x 110	4	310			8.00
410 x 110		410			9.10
510 x 110*		510			10.20
610 x 110		610			11.30

Kabelbærerne svejses på fladstål med indbyrdes afstand : max. 300 mm.

Overfladebehandling :

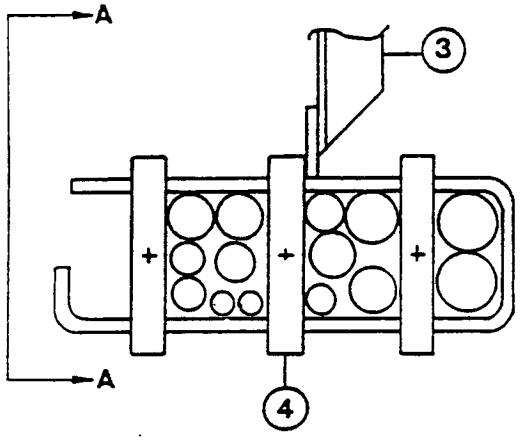
Se malespecifikation for pågældende skib.

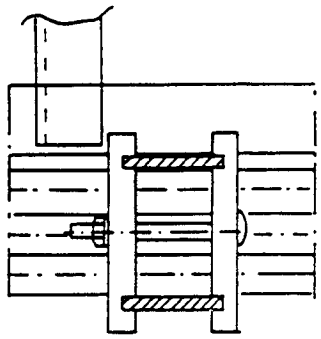
* b ikke DVS, øvrige mål som DVS.

Betegnelse : Benævnelse - OS nr. - TYPE - størrelse - længde

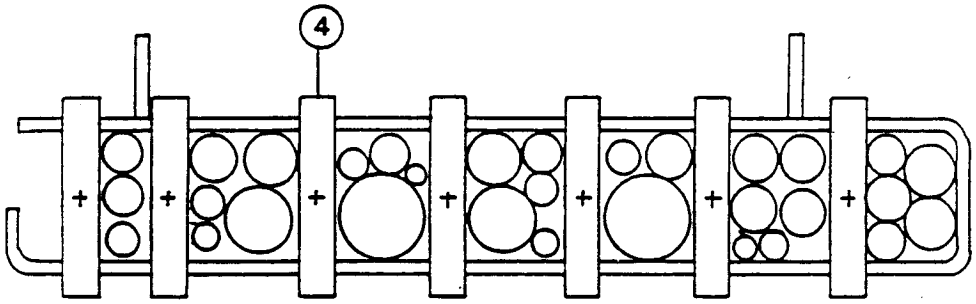
Eksempel 1 : Kabelbærer - OS 7115 - 1 B - 210 x 50 x 200
Eksempel 2 : Kabelbærer - OS 7115 - 4 - 2 x 410 x 110 x 2000

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
2	Fladstål	1		St. 44-2	FS 40 x 6		022307
1	Bærebøjle	1		St. 44-2	FS 40 x 5		022302





Eksempel 1



Eksempel 2

a) Svejsning ◺3.5

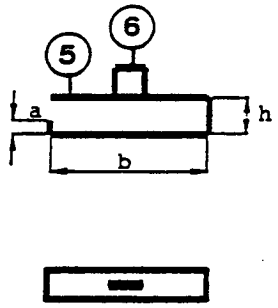
b) Kabelbærere type 18 og 2 på dobling monteres direkte på skot eller under dæk uden vinkeljernsbeslag. For type 38 og 4 skal der holdes en afstand på min. 50 mm mellem skibets stål og kabelbærernes fladstål.

c) For at opnå tilstrækkeligt gode afkølingsforhold må kabelbundter med strømbelastede kabler oplægges af max. 2 sidelæbende kabler mellem spændbeslag. Se eksempel 2 ovenfor.

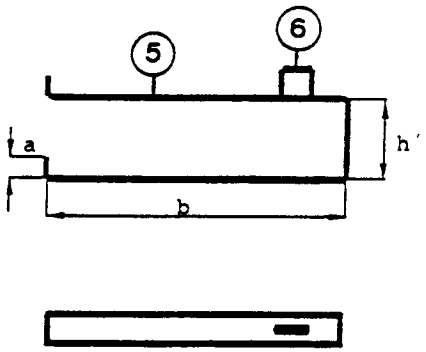
d) Påsvejsning af kabelbærer. Montageanvisninger : Se OS 0501.

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
4	Spændebeslag				OS 7117		
3	Vinkeljernsbeslag				Min. < 40x40x5		

Reference til : DVS 71002. Kabelbærer fremstilles efter DVS tegning.



TYPE 1B og 2



TYPE 3B og 4

Størrelse (b x h)	Standardiseret som DVS type	b	h	a	Vægt kg/stk.
100 x 50*	1B	100	50	20	0,49
150 x 50		150			0,60
210 x 50		210			0,78
410 x 50	3B	410			1,48
310 x 80	4	310	80	30	1,28
410 x 80		410			1,59
110 x 110*	2	110	110		0,63
210 x 110		210			0,95
310 x 110	4	310			1,32
410 x 110		410			1,64
510 x 110*		510			1,95
610 x 110		610			2,27

Kabelbærer form G.S. kan udvides med kabelbærer form G.E. (se eksempler side 4). Form G.E. påsvejses enkeltvis.

Kabelbærer form G.E. må aldrig være større end den oven over siddende kabelbærer.

Overfladebehandling :

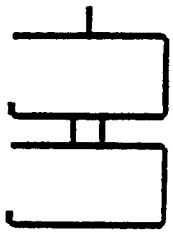
Se malespecifikation for det pågældende skib.

* b ikke DVS, øvrige mål som DVS.

Betegnelse : Benævnelse - OS nr. - TYPE - størrelse

Eksempel : Kabelbærer - OS 7115 - 1B - 210 x 50

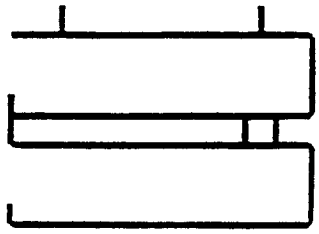
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
6	Samlestykke	1		St. 44-2	FS 40 x 5 x 40		022302
5	Bærebøjle	1		St. 44-2	FS 40 x 5		022302



Størrelse 2 x 210 x 110

FIGUR 1

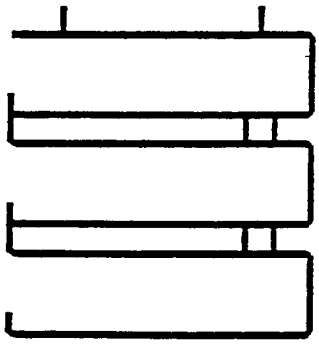
Vægt total : 8.4 kg/m



Størrelse 2 x 410 x 110

FIGUR 2

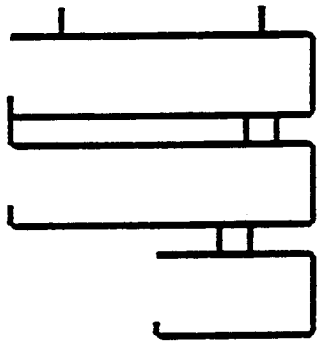
Vægt total : 14.9 kg/m



Størrelse 3 x 410 x 110

FIGUR 3

Vægt total : 20.6 kg/m



Størrelse 2 x 410 x 110 + 1 x 210 x 110

FIGUR 4

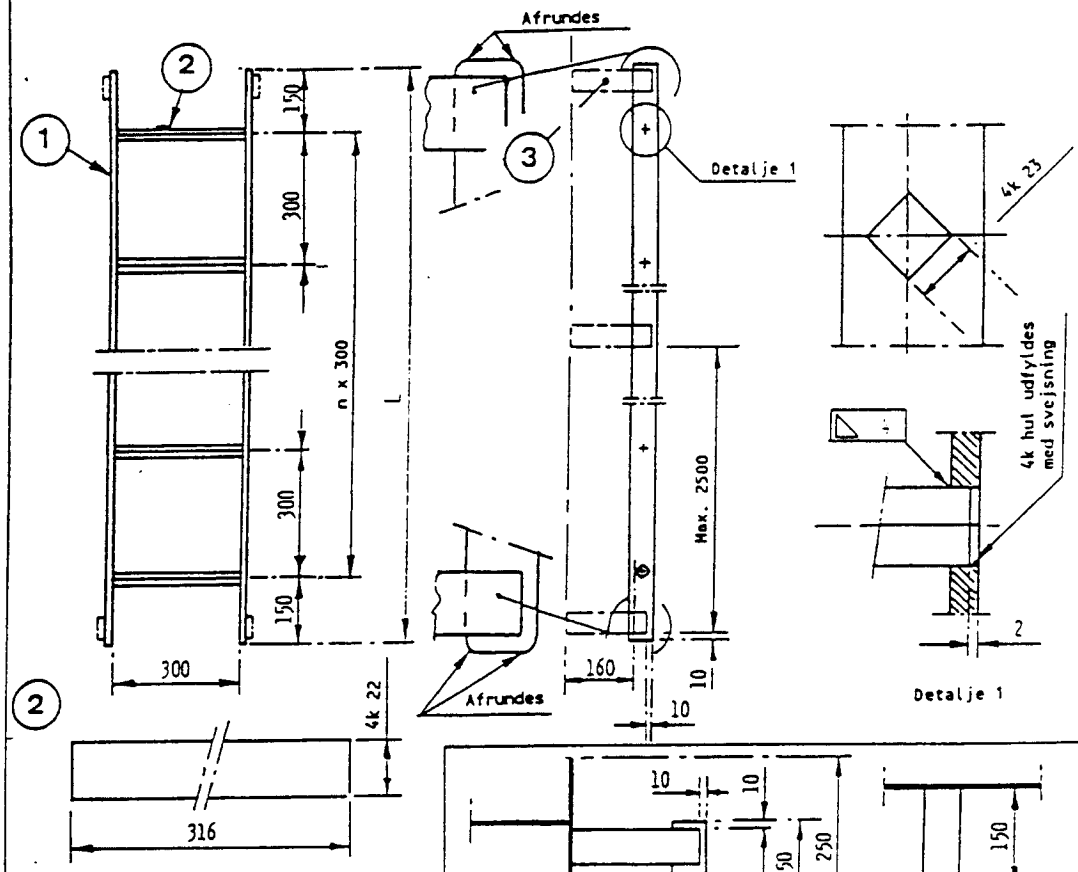
Vægt total : 14.9 kg/m

Generelt :

"Ophængningsbeslag" aftapes 50 mm, når kabelbærer varmforzinkes eller får anden overfladebehandling.

OBS! Giftig svejserøg ved montage.

Specifikation og arbejdsinstruktion : Se side 2.

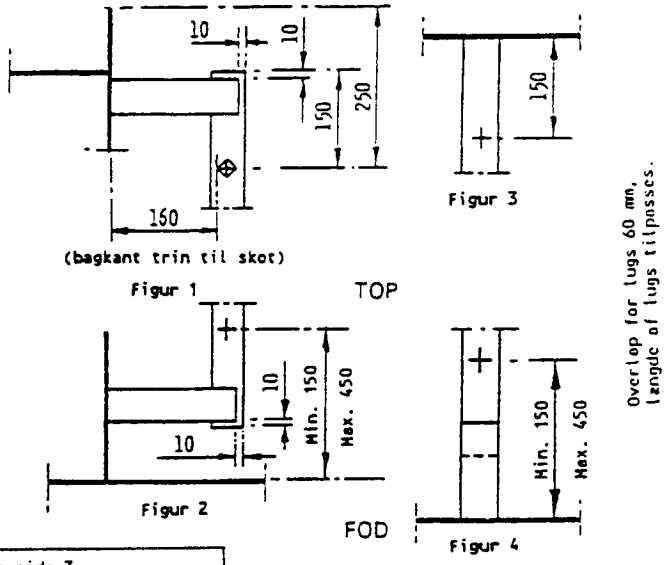


Antal trin = $\frac{L}{300}$

Antal luge pos. 3, min. 4 angives af tegnestuen.

3.5 Luge til lejder

5 Lugs til skot o.s.v.



MONTAGEEKSEMPLER

For stållejder : Monteret på mast o.s.v. : Se side 3.
Ved platforme, gennemgangshuller : Se side 5.
Rygbøjler : Se side 4 og 6.

Betegnelse : Benævnelse - OS nr. - L/Antal trin - Antal lugs - Montage fig. nr. (top/fod)

Eksempel : Stållejder - OS 5020 - 2700/9 - 6 - 1/2

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
3	Lugs				Se side 3		
2	Trin		1,2	St. 37-2	4k - 22 - 316		034164
1	Vange	2		St. 44-2	FS 55 x 10 - L	4,32 kg/m	022576

GODKENDT AF:

I OVERENSSTEMMELSE MED:

SPECIFIKATION:

ANVENDELSE:

Master, samsonposter og dakshuse, hvor der er trange pladsforhold.

OBS.: 1) Hvor behov nødvendiggør dette, anbringes rygbøjler (arbejdsbøjler), se side 4, angives af tegnestue.

2) Hvor særlige forhold gør sig gældende kan rygbøjle med stænger anvendes, se side 6, angives af tegnestue.

TOLERANCER:

Hvor ikke andet er oplyst udføres standarden i overensstemmelse med OS 0400 grad: 4.

SVEJSNING:

Svejsesignaturer i overensstemmelse med OS 0215.
Fuldsvejsning, hvor ikke andet er oplyst.
Porehuller og slaggeindeslutninger må ikke forekomme.

OVERFLADEBEHANDLING:

I henhold til malespecifikation.

MATERIALEDISPOSITION:

X	Alt materiale er lagerført
	Enkelte materialer købes af tegnestue
	Alle materialer skal købes af tegnestue - Rekv. gældende stykliste

KONTROL:

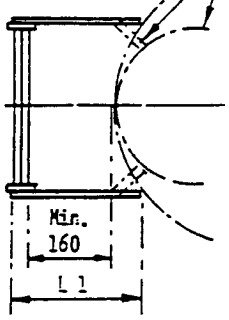
Vange længde	Antal trin	Overflade m^2	Vægt total kg 1)
300	1	0,1044	3,63
600	2	0,2088	7,26
900	3	0,3132	11,0
1200	4	0,4176	14,5
1500	5	0,5220	18,2
1800	6	0,6264	21,8
2100	7	0,7309	25,4
2400	8	0,8352	29,0
2700	9	0,9396	32,7
3000	10	1,0440	36,3

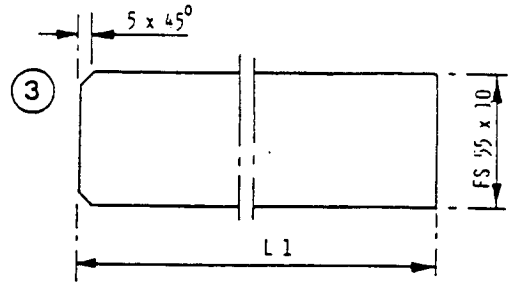
1) uden lugs.

LEVERINGSTILSTAND:

Emnet leveres rengjort, uden skarpe kanter, fri for svejsestænk, grater, skævheder og lignende.

OBS.: Ved dim. mindre end ø 500 anvendes lugs pos. 38



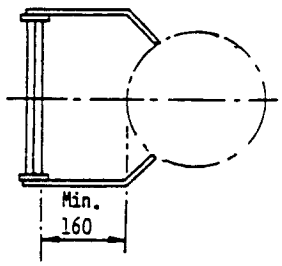


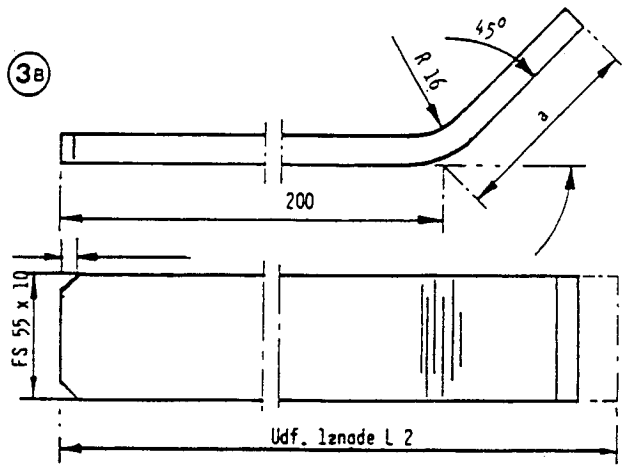
Lejder monteret på mast o.s.v.
Mast dimension fra ø 500 til plant skot.

Mast dimension udvendig øD	L_1	Vægt kg/stk.
500 - 700	255	1,10
700 - 2000	235	1,01
2000 - og større	225	0,97
Plant skot	195	0,84

Betegnelse : Benævnelse - OS nr. L_1

Eksempel : Lugs - OS 5020 - 225





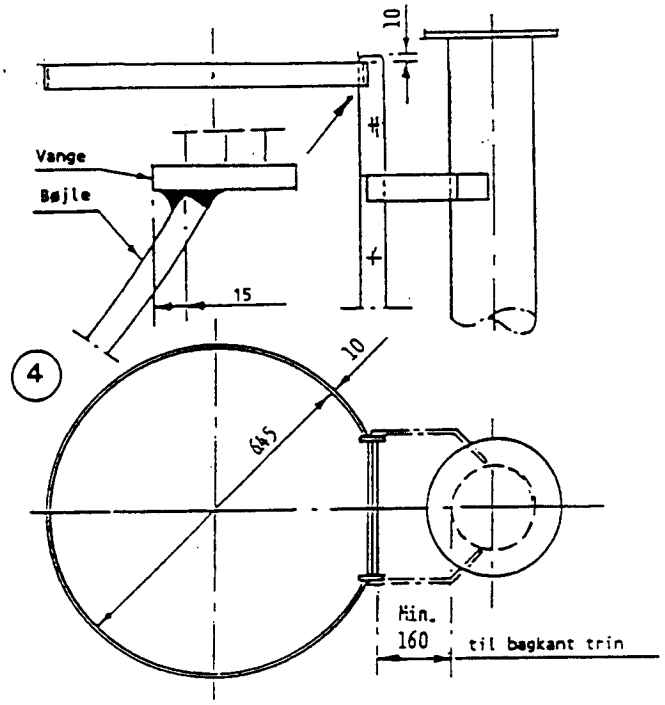
Lejder monteret på mast o.s.v.
Mast dimension ø 200 til og med ø 500.

Mast dimension udvendig øD	a	Udført L_2	Vægt kg/stk.
200 - 250	100	294	1,27
250 - 300	85	279	1,20
300 - 500	75	269	1,16

Betegnelse : Benævnelse - OS nr. - L_2

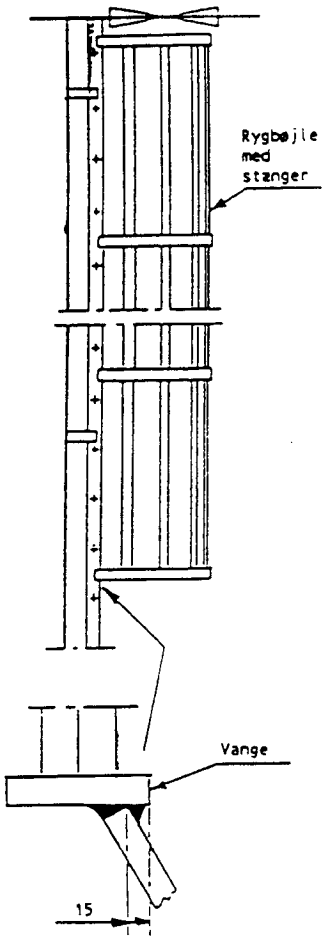
Eksempel : Lugs - OS 5020 - 294

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
38	Lugs			St. 44-2	FS 55 x 10 - L_2	L_2 - se tabel	022576
3	Lugs			St. 44-2	FS 55 - 10 - L_1	L_1 - se tabel	022576



FIGUR 5

TOP



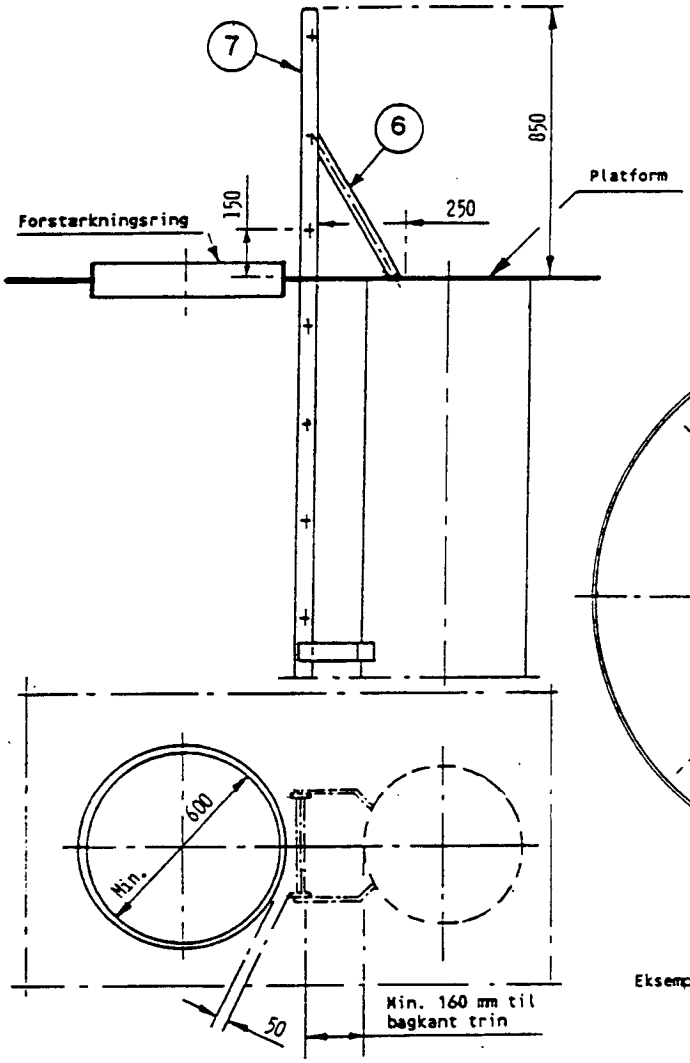
Figur 7

Detaljer for rygbøjler med stænger : Se side 6.

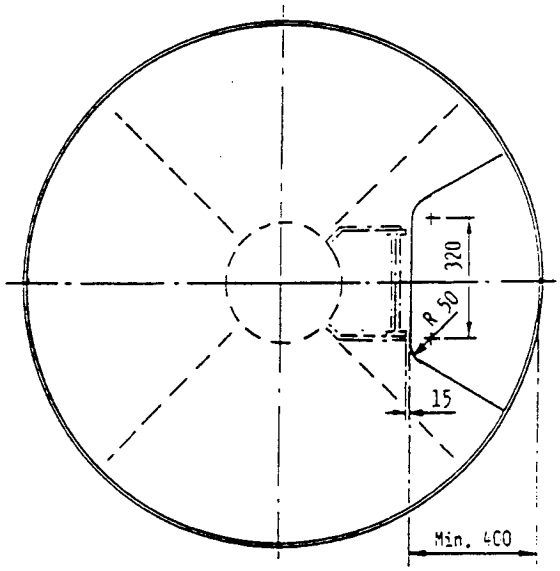
Betegnelse : Benævnelse - OS nr.

Eksempel : Rygbøjle (arbejdsbøjle) - OS 5020

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
4	Rygbøjle (arbejdsbøjle)	1	4,52	St. 44-2	FS 55 x 10 - 1717		022576



Gennemgangshul angives af tegnestuen



Eksempel : Gennemgangshul i rund platform, platform tegnes af tegnestuen.

FIGUR 6

TOP

POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.
7	Lejder	1			OS 5020 - 850 - 3		
6	Straber	2	1,41		OS 5008 - FA		410193

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http://www.nsrp.org/

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http://www.USAShipbuilding.com/